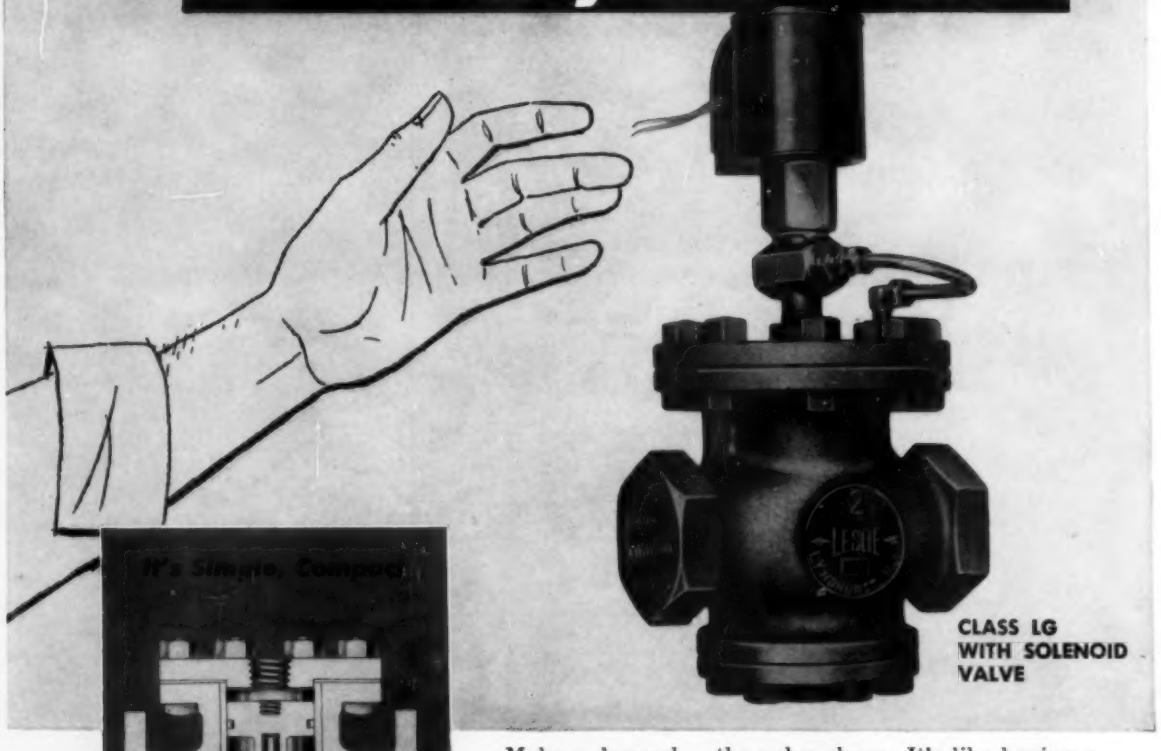
REVIEW AND FORECAST
35 How do you stack up?
36 Steam
40 Electricity
47 Gases
49 Liquids
53 Fuels
57 Wastes
59 Mechanical Power
61 Instrumentation and Control
63 Fire Extinguishing
64 Lubrication

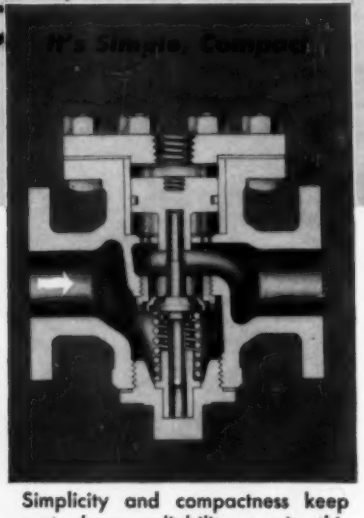
JANUARY 1956

Industry & Power

This operating valve is *always* within *reach*



CLASS LG WITH SOLENOID VALVE



Simplicity and compactness keep cost *down*, reliability *up* in this Leslie Class LP operating valve.

Make a demand — the valve obeys. It's like having a third hand and a long arm as the control for this shut-off valve is *always* within *reach*.

You can get Leslie shut-off valves equipped with an electric solenoid valve (Class LG) or you can operate them remotely (LP) with air or hydraulic relay valve. Valve opens and closes on demand of a manual or automatic signalling device (pressure switch, thermostat, etc.)

Designed for off-on service, there are units with body ratings to 1,000 psi and temperatures to 750°F. The valves give fast, tight shutoff of steam, air and non-corrosive fluids.

Ask your Leslie engineer to help you select the operating valve that's engineered to meet your service requirements. You'll find him listed under "Valves" or "Regulators" in your classified telephone directory.

Bulletin 5309 describes operating valves.
Send for it today.

TRADE LESLIE MARK

REGULATORS AND CONTROLLERS

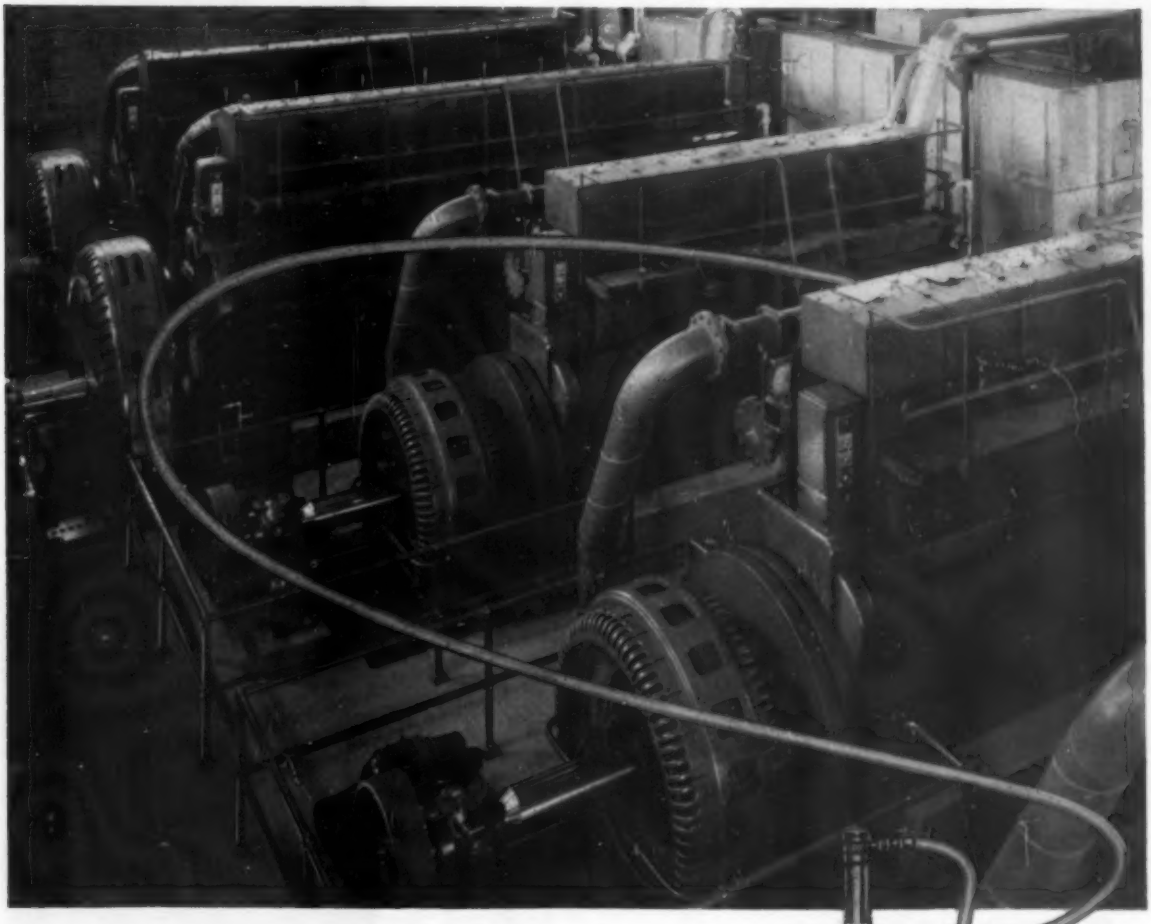
LESLIE CO., 263 GRANT AVENUE, LYNDHURST, NEW JERSEY

131

CONTROLLED QUALITY MEANS QUALITY CONTROLS

Circle 132 on READ-N-CIRCLE card for more data

Log More Hours !



Log more hours . . . the *extra* hours of peak performance you get when you switch to Sinclair RUBILENE®. RUBILENE guards diesels against sticking rings and prevents excessive wear of moving parts operating continuously for long periods. You will find that RUBILENE lubrication pays off in lowered maintenance costs and your engines log more time between overhauls.

Switch to Sinclair RUBILENE or RUBILENE H. D. Oils. See the difference it can make in your engine log books. Call your local Sinclair Representative or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, New York.

SINCLAIR

RUBILENE OILS

Circle 123 on READ-N-CIRCLE card for more data

320,000 CUBIC FEET PER MINUTE!

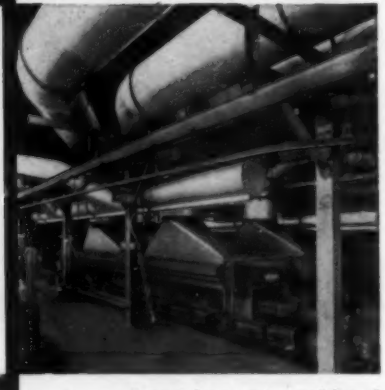
Fumes are really given the air at G.H.R. Foundry, Dayton, O., where Kirk & Blum installation serves 4 pouring lines

A 260,000 C. F. M. exhaust system whisks fumes, smoke, and gases from four pouring lines and two Kirk & Blum smoke tunnels. Offset exhaust stacks clear overhead cranes. A separate 60,000 C. F. M. supply system furnishes outside air for man cooling at the pouring lines.

This installation at G. H. R. Foundry, Dayton, Ohio, typifies Kirk & Blum's complete service: Design, Fabrication, and Installation of Dust and Fume Control Systems.

Let Kirk & Blum design a system specifically engineered for conditions in your foundry. Put "Clean Air . . . the Invisible Tool" to work in your plant.

Write today outlining your fume and dust problems.



Fume exhaust system and forced air cooling of working area

Core cooling, fume exhaust and worker cooling arrangement

THE KIRK & BLUM MANUFACTURING CO.
3174 Forrer Street Cincinnati 9, Ohio

KIRK & BLUM
FUME AND DUST CONTROL SYSTEMS

Circle 108 on READ-N-CIRCLE card for more data

Industry & Power

SERVING INDUSTRY'S POWER SERVICES

VOLUME 70 NO. 1 JANUARY 1956

In this issue . . .

Annual Review and Forecast, An Introduction to the 1956 Issue 35

Special Report on Steam 36
Trends in temperatures, pressures, package boilers, operating techniques, piping and traps, thermal insulations, high-temperature water, turbines, standby.

Special Report on Electricity 40
Trends in load growth, switchgear, transformers, insulations, conductors, motors, lighting, communications.

Special Report on Gases 47
Trends in the basic gas of industry — air — show air conditioning and its problems gaining prominence. Compressed air continues basic as one of industry's important energy-delivering mediums.

Special Report on Liquids 49
Trends in water conservation, cooling towers, boiler water, water treatment, valves, piping.

Special Report on Fuels 53
Trends in fuels selection, firing techniques, refuse firing, atomic power, direct conversion of hydrocarbons to electricity.

Special Report on Wastes 57
Trends in area-wide control, air pollution, water pollution, incineration.

Special Report on Mechanical Power 59
Trends in speeds, clutches, bearings.

For All of Industry's Power Services 61
Special Report on trends in Instrumentation and Control, Fire Extinguishing, Lubrication.

In brief . . . .
ASME Fall Annual Meeting 65

monthly features

nuclear news	6	handy guide	75
new products	10	books and films	80
readers write	20	coming events	81
new bulletins	22	names make news	82
ideas in action	28	free bulletins	86
this month's comment	33	available reprints	90
spot news	67	advertisers' index	92

INDUSTRY & POWER including INDUSTRIAL POWER, is published monthly by The John Paul Taylor Publishing Co., Commercial Bank Building, Saint Joseph, Mich. Member of Business Publications Audit of Circulation, Inc. and National Business Publications, Inc. Accepted as Controlled Circulation Publication at Saint Joseph, Michigan.

Copyright 1956, The John Paul Taylor Publishing Co.

Subscription information: Mailed without charge to executives and engineers in selected plants and organizations who are responsible for the selection, installation, operation, and maintenance of equipment required for Industry's Power Services. To all others there is a subscription price of $10.00 per year in U.S. Outside U.S. subscription price $15.00 Single copy $1.00. Send Form 3579 to Saint Joseph, Michigan.

This Niagara Aero After Cooler also cools compressor jacket and intercooler water.

COMPRESSED AIR
• Lower in Cost
• Drier and Cooler

THE NIAGARA *AERO* AFTER COOLER offers a completely self-contained method replacing both shell-and-tube cooler and cooling tower. It is independent of a large supply of cooling water and consistently reduces compressed air temperatures to below ambient.

Drier air gives you better operation and lower costs in using all air-operated automatic instruments, tools and machines, paint spraying, sand blasting and moisture-free air cleaning.

Direct saving in the cost of cooling water saves the price of the Niagara *Aero* After Cooler in less than two years.

Niagara *Aero* After Cooler assures all these benefits because it cools compressed air or gas below the temperature of surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air through a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter, proven in service on the largest plant utility systems.

Write for Bulletin No. 130

NIAGARA BLOWER COMPANY
Dept. I.P., 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

Circle 109 on READ-N-CIRCLE card

IMMEDIATE DELIVERY

from the World's Largest Stock

CHROMALOX

Electric Heaters

Chromalox offers you prompt service from the world's largest factory stock of industrial electric heaters . . . over 15,000 types, sizes and ratings. Local stocks at points throughout the nation.

There is a specific Chromalox Electric Heater to heat liquids, air and gases. For heating platens, dies, molds, moving metal parts . . . anywhere you need fast, clean, economical and easy-to-control heat up to 1100° F.

Let the Chromalox Sales-Engineering staff solve your heating problems . . . electrically

Write for your copy of Catalog 50

Contains information on complete line of Chromalox Electric Heaters, elements, thermostats, contactors and switches. Gives uses, construction information and prices, plus basic heat calculation data and heat loss charts.

For ideas on additional applications of electric heat, request Booklet F1550—"101 Ways to Apply Electric Heat." Write today.

Edwin L. Wiegand Company

7520 Thomas Boulevard, Pittsburgh 8, Pennsylvania

EDWIN L. WIEGAND COMPANY
7520 Thomas Boulevard, Pittsburgh 8, Pa.

☐ Please send me Catalog 50
☐ Please send me "101 Ways"
☐ Have a Sales-Engineer contact me.

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

A-4447A

Circle 114 on READ-N-CIRCLE card

nuclear news

. . . about industry & power

WHICH WAY TO GO?

Among observers close to the field, the following are most critical among the obstacles to be cleared for economic nuclear power: Fabrication techniques for fuel elements; special development of auxiliaries such as pumps, controls, vessels, and heat exchangers; effective utilization of metals, plastics, concrete, and refractories in techniques not yet developed; application of nuclear reactor heat for direct space and process heating; increased conversion of atomic wastes to usefulness as sources of radiation for instrumentation, sterilization, production processing, and medicine.

STUDY OUTLET FOR COAL IN NUCLEAR ERA

The National Coal Association has established a special atomic energy committee to make a continuing study of the influence of atomic energy on operations of the coal industry. The committee has responsibility for formulating a policy for the coal industry with regard to atomic energy. Kenneth A. Spencer, chairman of the committee, has already stated that atomic energy is "not a monster that will swallow the coal industry. It may well become a companion with coal in the development of new uses for coal."

INDUSTRIAL-SIZE REACTOR PROGRAM LAUNCHED

Industrial-size reactor plants – ranging from 5000 to 40,000 kw – will be the subject of the second round in the AEC's power demonstration reactor program. Invitations are extended to individual organizations or to groups, whether public or private utilities or equipment manufacturers, for proposals covering development, design, construction, and operation of nuclear power plants in three capacity ranges. These ranges are 5000 to 10,000 kw; 10,000 to 20,000 kw; and 20,000 to 40,000 kw.

SO YOU WANT TO BUY A NUCLEAR POWER PLANT

Getting down to hard realities, an AEC spokesman said ". . . . Suppose that you want to acquire a nuclear power plant . . . . You will find one major difference between conventional power plants and atomic power plants. All atomic power plants are in the research and development stage. You will have to buy your plant largely on faith in the scientists, engineers, and manufacturers

BETZ • *A Great Name*
In Water Conditioning

Engineer at work!

If you were to walk into the Engineering Department of our Philadelphia headquarters, chances are you'd see a vacant desk or two like this. And for good reason!

The engineer who occupies this desk might be in Maine, California, Texas . . . anywhere in the country providing supplemental assistance on water problems . . . helping your *personal* representative, the Betz District Engineer and *you* to do a better job in your plant.

He's one of a group of over 20 Betz specialists that make up our fully-staffed Engineering Department . . . providing *additional* headquarters engineering support as well as in-the-field engineering as required.

It is the responsibility of the Betz Engineering Department to carefully analyze the many facets of information concerning your water problems . . . to engineer, interpret, and diagnose the situation as it exists in your plant . . . and to work with the Betz District Engineer to recommend the correct steps to overcome the difficulty.

This *complete* engineering service is another reason why Betz *continues* its leadership in providing sound engineering on all water problems. It will pay you to talk with a Betz District Engineer today. No obligation, of course.

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa.

In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Circle 133 on READ-N-CIRCLE card for more data

next month in
INDUSTRY & POWER . . .

electrical refresher

Plan now to read the first article in the Electrical Refresher starting next month. This Refresher is written for all engineers—regardless of their original training — who want to brush up on electrical fundamentals.

Author of The Electrical Refresher is a reknowned engineering educator. His previous writings are standard works in the field. He will bring to the pages of INDUSTRY & POWER topnotch skills in his easy-to-comprehend articles. Watch for The Electrical Refresher starting in the

**February issue of
INDUSTRY & POWER**

you can still get
I&P's special report on

electrical distribution

You should know about the trends that are constantly reshaping electrical practice in industrial plants. This comprehensive report offers a complete analysis of these trends in terms that apply directly to your problems.

To meet the continuing demand for this special report, reprints are made available to all readers. Single copies are free; 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies are 10¢ each.

Address all orders to

**Reader Service Department
INDUSTRY & POWER
Commercial Bank Building
St. Joseph, Michigan**

who will design and make it for you. No one, as of now, can point to any atomic plant operating in the United States which was designed primarily for use in generating electric power. Thus, the performance, life, and economics of a nuclear power plant can only be estimated – and with an unknown degree of accuracy. Those purchasing atomic power plants during the next few years will be pioneering this new energy frontier in the true sense."

OPTIMISM FLOURISHES IN NUCLEAR QUARTERS

Among the most recent signs of optimism coming out of the nuclear field is this note sounded by AEC chairman Lewis L. Strauss: "I am optimistic that we will have economic nuclear power in the United States, possibly sooner than even the most optimistic of the prognosticators believe. There are areas of present-day research where breakthroughs could occur to upset all our calculations. There is both justification and need for optimism." . . . Allis-Chalmers expects that generating capability from atomic energy will reach one million kw by the early 1960's, calling for an expenditure of $300 million.

REACTOR BULLETINS AVAILABLE

Demonstrating that nuclear reactors have come to be a purchasable commodity, General Electric currently is distributing two bulletins on nuclear reactors for test and research purposes . . . . Another evidence that the nuclear art is reaching maturity rests on the fact that a conference has just been concluded, under the auspices of the American Standards Association, that considered the broad question of whether there is now a need for the development of national standards and codes in the field of nuclear energy.

ANNOUNCE FOREIGN NUCLEAR PROJECTS

Westinghouse will build a pressurized water reactor plant, rated 11,500 kw, for Belgium. It will provide electrical energy during the Brussels World's Fair in 1958. This will be the first completely privately financed atomic-electric power plant to go into operation anywhere in the world . . . . Electric Bond & Share Company has invited bids on three 10,000 kw power plants to be built in Latin America. One of its subsidiaries, Ebasco Services, will evaluate the bids. Among the countries likely to be picked for these nuclear plants are Argentina, Brazil, Chile, Colombia, Cuba, Costa Rica, Ecuador, Guatemala, Mexico, Panama, and Venezuela.

Specify

CHAPMAN

STEEL VALVES

in any of the

Standard Alloys

to meet your steel valve needs

When you specify Chapman Steel Valves you also specify steels designed for your specific services. Standard alloy steels match every normal industrial requirement. Special alloys can be furnished for extraordinary service conditions. All metals are poured in Chapman's own foundries under rigid laboratory supervision.

Exceptionally close machining tolerances are another standard feature of Chapman Steel Valves. Under the most severe conditions, Chapman Steel Valves seat tightly and positively, without jamming, chattering, or wearing excessively. Operation remains smooth and dependable; maintenance costs stay low.

See Chapman *first* for gates, globes and checks in all pressure classes — 150, 300, 400, 600, 900, 1500 and 2500 pounds — and for temperatures to 1150°F. Valves are available with welded, pressure seal, or bolted bonnet joints and with flanged or welding ends. ASA standards are equalled or exceeded in every range. Write for Catalog 20.

THE CHAPMAN VALVE MANUFACTURING COMPANY

INDIAN ORCHARD, MASSACHUSETTS

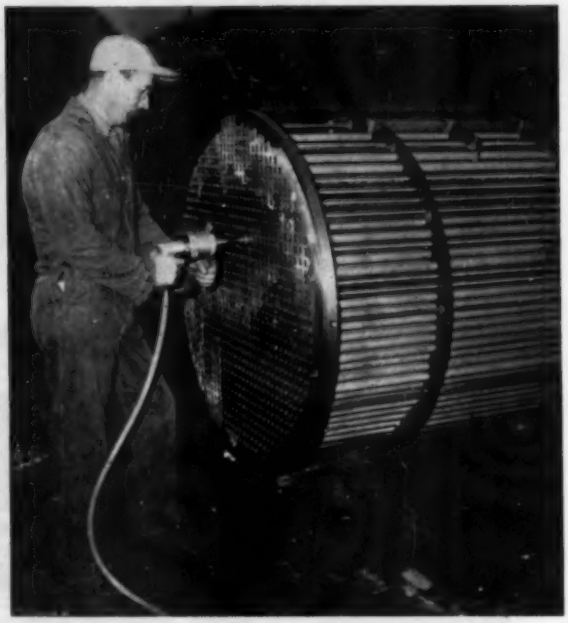
Circle 130 on READ-N-CIRCLE card for more data

new products

. . . just circle key numbers on READ-N-CIRCLE card on page 75

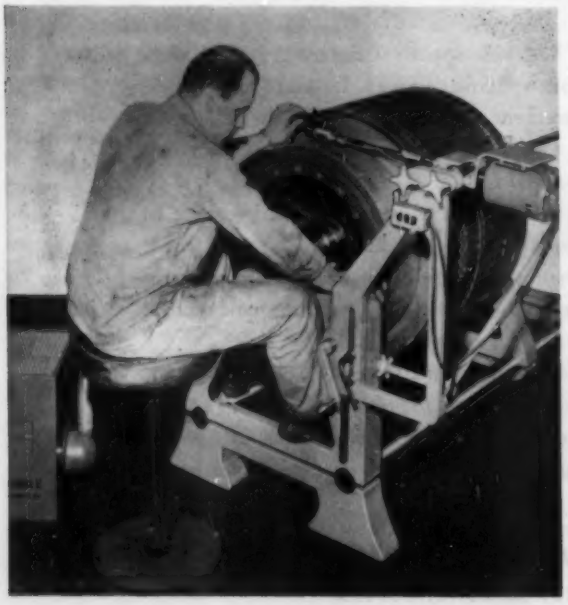
700-Air-driven tube expander accurately controls expansion

Problem of overrolling tubes when using a tube expander has now been overcome with introduction of the Torq-air-matic. Precise, consistent control gives uniform and tight pressure joints, regardless of tube-sheet variations. Cold working of metal to destruction and consequent tube replacement is eliminated. Sheets are not over stressed. Warpage and ligament "pushover" is minimized. Precise expanding also means greater tube life and minimum axial pressure against tube sheets. Bowing of tubes is reduced so that heat transfer rates stay high. This expander does not depend on consistency of frictional devices, and torque is measured at the output spindle. Air drive makes tool lightweight, yet 14 foot-pound torque is good for tubes up to one inch ID. One air hose is only connection needed — there is no control box. Has simple new type, snap-on floating chuck that needs only one motion to engage or disengage mandrel. Available for ¼-, ⅜-, or ½-inch square mandrels. Handle can be swivelled to any position for easier use. Motor lubrication is automatic from reservoir in handle. May be used as close as 2 inches from side of shell without use of universal joints and extensions. Has same "feel" as any manually controlled tube rolling motor. THOMAS C. WILSON, INC.



701-Shop-type undercutter for all armatures

Versatile shop-type mica undercutter handles large armatures, is also practical for medium and small armatures. Can be adjusted to compensate for different diameter shafts at either end, skewed commutator slots, and so forth. Refinements include a dust collector for quick removal of mica dust, glass shield and light for operator comfort. THE MARTINDALE ELECTRIC CO.

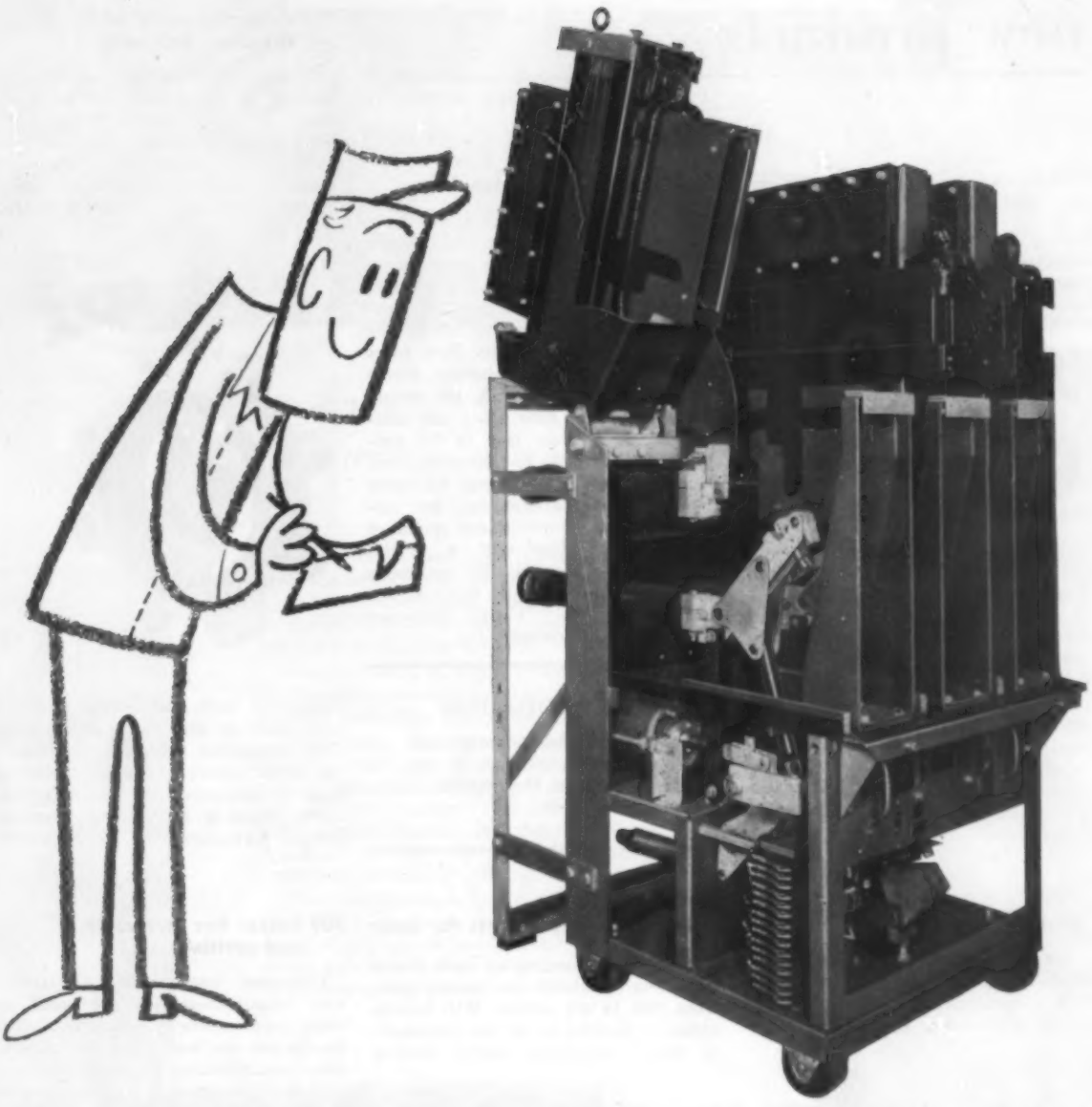


702-Improved clarification system removes oil

Simultaneous clarification of water containing both settleable and nonsettleable particles is now practical. Solids-contact clarifier now comes with a surface skimmer. System is effective in treating white waters from pulp and paper mills and in removing oil from water containing settleable solid particles. Surface skimmer is powered by a separate drive mechanism and covers entire surface of clarifier. GRAVER WATER CONDITIONING CO.

703-Pneumatic switching valve is automatic

Pneumatically operated switching valve for use with dual pressure pneumatic control systems switches automatically on a dual supply pressure change, eliminating need for separate air line from central station. V-132 reduces installation time and cost, and eliminates need for a second pressure-electric switch and solenoid air valve. Three pipe connections are normally open, normally closed, and common. JOHNSON SERVICE COMPANY.



SEE VALUE HERE YOU'LL SEE NOWHERE ELSE

Operating engineers in the electrical industry often say you can see the higher quality in I-T-E switchgear even when you stand 'way back.

Of course, they're only partly right. You can easily see the practical component arrangement, the all-welded steel construction with compartments designed to retain shape even when lifted as a unit, and the clean, neat appearance. These are standard on all I-T-E switchgear.

But we want you to look closer—see even more. For example, in Metal-Clad Switchgear: the easy-to-service horizontal drawout design; the tilting arc chutes; the extra-heavy insulation. There's quality in every detail—quality that means dollars' more value for your switchgear investment and years' longer troublefree service.

Why not phone the I-T-E office nearest you. Or write for bulletin 7004 giving a complete description of 5, 7.5 and 15 kv switchgear. I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY · Switchgear Division

Circle 112 on READ-N-CIRCLE card for more data

new products

. . . starts on page 10

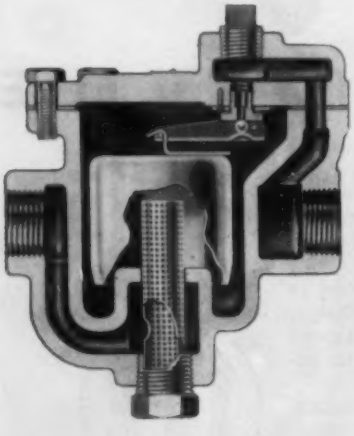
704-Electrical wireway with or without flanges

New line of electrical wireway and fittings includes both flanged and flangeless wireway, accessory fittings, and components for assembling com-

plete electrical wireway systems. Flanged wireway is available in 2½-, 4-, and 6-inch square units in lengths from 1 to 5 feet. Units are equipped with knockouts on three sides and full-length hinged covers. Easily attached screw-on covers may be taken off without removing screws. May be easily clamped together. Units clamp together with handy connectors. Screw shields protect wire as it is drawn through. THE HUENEFELD COMPANY.

705-Bucket trap retains prime

Loss of prime with consequent blow-through of steam is impossible with a new bucket steam trap. New valve mechanism achieves this re-



sult without reducing capacity or operating pressure ranges. SARCO COMPANY, INC.

706-Controled time-lag fuses

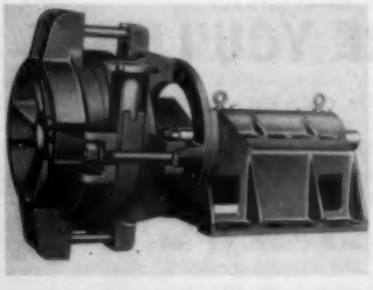
Dual element fuses for applications in which long and controlled blowing time is desired eliminate unnecessary blowouts and downtime. This protection extends up to 500 percent overloads, with provision for immediate blowout on short circuits. New fuses protect against single phasing, eliminate need for overfusing, and assure cooler operating fuse boxes and panels. Range of sizes is 0 to 600 amperes in both 250 to 650 volts, ferrule and knife-blade types. All carry Underwriters' Laboratories, Inc. approval. Fuse elements are made of an exclusive alloy with a precise melting point. Heated alloy maintains its shape and strength until it becomes completely liquid. ECONOMY FUSE & MANUFACTURING CO.

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 75.

707-Slurry pump adjusts for wear

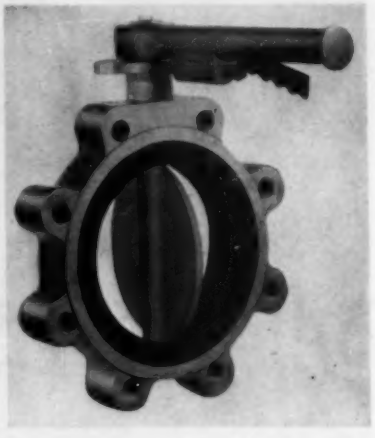
Low-speed, continuous-duty slurry pump is available in seven sizes from two to six inches. Will handle abrasive slurries up to the maximum of fluid consistency under suction



lift of positive head. Pump features include stuffing box that is subject to suction pressure only, wearing parts that can be reached without disturbing piping, and an adjustable rotating element that can be taken up for wear. MORRIS MACHINE WORKS.

708-Butterfly valve with threaded bolt holes

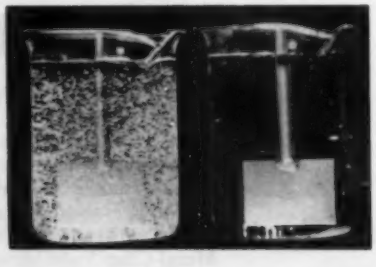
Butterfly valves for use between flanges have threaded bolt holes instead of usual drilled holes. Short bolts or cap screws are used for connection to flanges. With valve in closed position, this permits the flange on either side of the valve to be dis-



connected, with full operating pressure held in line on opposite side. This eliminates necessity of "bleeding down" entire line when a portion must be disconnected. This Lug-type valve requires no gaskets between flanges. KEYSTONE TOOL CORPORATION.

709-Faster floc formation and settling

Low-cost, low-dosage coagulant and coagulant-aid is successful in many cases where presently available treatments are ineffective and where iron- and alumina-floc carryover is a

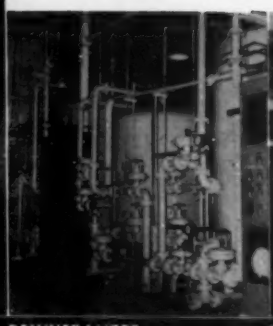


problem. Nalco 600 is recommended for service water and waste treatment. Product is a clear alkaline liquid that is non corrosive to steel. It has proved useful in lime-soda plants and processes. NATIONAL ALUMINATE CORPORATION.

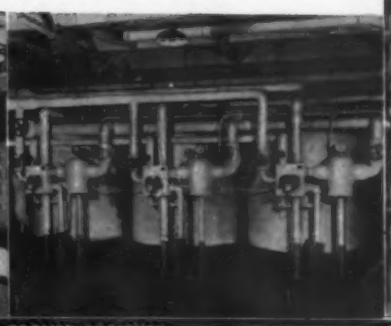
(more new products on page 16)

Circle 137 on READ-N-CIRCLE card for more data

DEAERATOR



DEMINERALIZER



ZEOLITE SOFTENER

HOT PROCESS SOFTENER

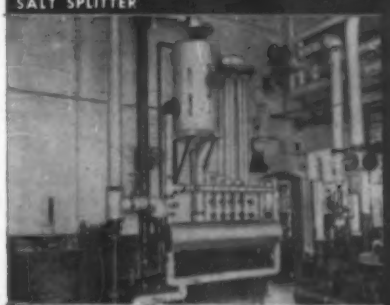
Engineering and Equipment by **Cochrane** *assure complete water conditioning service*

REACTOR

MULTIPORT RELIEF VALVE

SALT SPLITTER

MULTIPORT DRAINER



CONTINUOUS BLOW-OFF

For over half a century Cochrane Corporation has pioneered major developments in the field of water conditioning. Today, Cochrane leads in installation of deaeration, hot process and hot lime zeolite equipment.

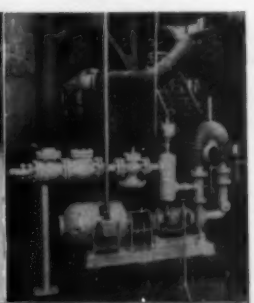
Development of the Cochrane Hydromatic Valve sets a new standard in automatic control for Ion Exchange Processes.

Cochrane's background as heat engineers has also been responsible for the development of steam specialties recognized and used throughout industry today. The C-B Jet Pump improves heat transfer, reduces drying costs with resultant product improvement and usually increases production output.

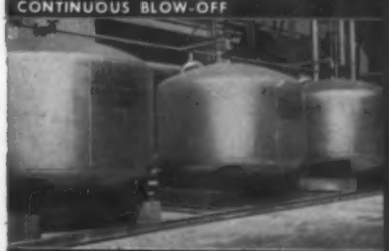
This complete service, available at Cochrane, provides a single responsibility for continuous satisfactory operation of every installation. It is an assurance that guarantees will be met. Why not consult Cochrane?

STEAM PURIFIER

OIL SEPARATOR



C-B SYSTEM



FILTER

COCHRANE CORPORATION · WATER AND HEAT ENGINEERS SINCE 1863 · PHILADELPHIA

Cochrane
CORPORATION

Representatives in 30 principal cities in U.S.; Toronto, Canada; Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.
Pottstown Metal Products Division—Custom built carbon steel and alloy products

3108 N. 17TH STREET, PHILADELPHIA 32, PA.

NEW YORK • PHILADELPHIA • CHICAGO

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blowoff Systems • Condensate Return Systems • Specialties

More Efficient Refuse Burning

Read This Article in Power Magazine

RECONDITIONED BOILERS at sugar mill come from irrigation pumping plant seven miles from mill. Mounds in foreground are bagasse fuel. Conveyor brings fuel to refuse feeders shown to right of boiler. Feeder is designed so moist fuel won't jam.

Mill burns residue with spreader stokers

Older boilers at sugar mill on island of Maui, Hawaii, gave poor bagasse firing efficiency, were hard to clean. So when time came for expansion, new units got modern firing equipment

By R H HUGHES, *Mill Department Head, Hawaiian Commercial & Sugar Co, Ltd*

► OUR EXPANSION PROGRAM at the Puunene Mill, largest sugar factory in Hawaii, called for additional steam-generating capacity amounting to 100,000 lb per hr. Bagasse, residue from making cane sugar, was to be the primary fuel for the boilers furnishing this added steam.

Before expansion, all the boilers were fired with bagasse in step-grate furnaces with natural draft. Poor bagasse firing efficiency and furnace ash disposal difficulties dictated that we look for more modern firing methods for any new units at the cane-sugar-producing mill.

Decision to increase the mill capacity was made in 1951. And to get new boilers then meant extended delay in delivery because of the Korean conflict. Luckily the company had two 800-hp oil-fired Stirling boilers available. These units were at the recently electrified water pumping plant about seven miles from the mill. Inspection proved the boilers satisfactory for further use. So it was decided to go ahead on the basis of moving them to the cane-sugar mill.

Boilers. We contacted the manufacturer for a proposal for conversion of the units. Our needs were as follows: maximum continuous rating of 50,000 lb per hr per boiler operating at 150 psig, saturated steam; mechanical stoker equipment suitable for automatic combustion control for bagasse firing; mechanical removal of accumulated ash on grates.

The boiler manufacturers proposed removing certain generating tubes and

Detroit RotoStokers burn bagasse at the Hawaiian Commercial & Sugar Company, Limited, on the island of Maui, Hawaii. Bagasse is one of many types of refuse fuels, efficiently burned with Detroit Stokers. Others are wood bark, hogged wood, coffee grounds, nut shells, and corn cobs—either separately or in combination with coal, gas, or oil.

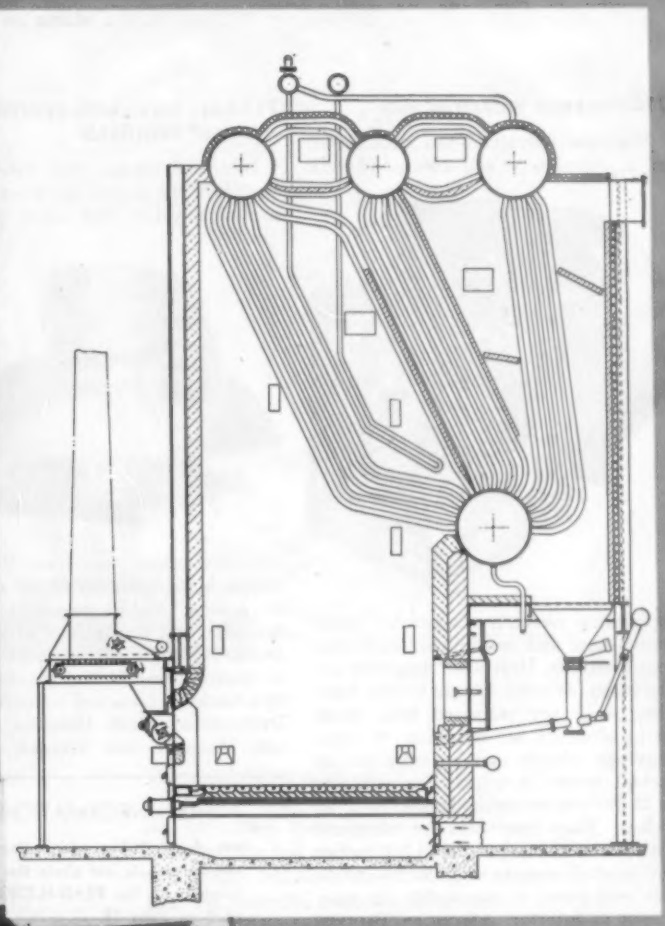
Detroit Stoker refuse conveyor feeders, an original design, automatically meter the fuel according to the load and in proportion to the air supply. The fuel is distributed evenly on the grate.

Each refuse burning installation is engineered to suit the fuel to be burned, the operating conditions, and the boiler furnace.

Write us for this reprint Bulletin 811

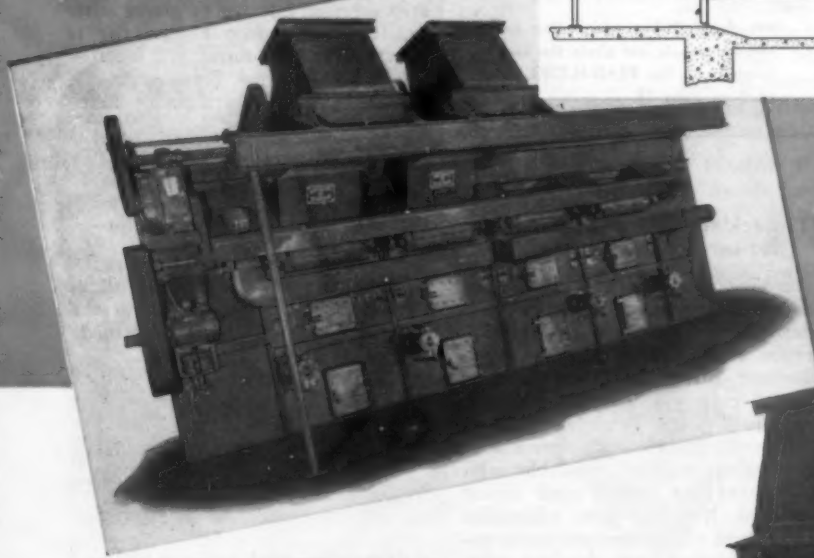
Your Print for Successful Refuse Burning

For producing low cost steam from refuse fuels, use Detroit RotoStokers equipped with refuse feeding rotor units and conveyor feeders. Uniform fuel distribution is assured. Rapid burning with high furnace turbulence is assisted by a properly designed overfire air system.

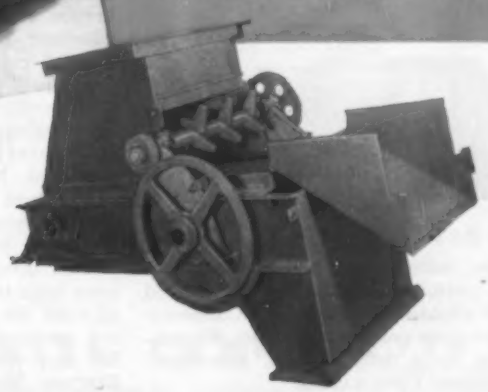


One of two Detroit RotoStokers with power operated dumping grates installed at Hamakua Mill Company, Limited, Paauilo on the island of Hawaii.

Capacity of this unit is 60,000 pounds steam per hour continuously, 72,000 pounds steam per hour maximum, burning bagasse fuel only.



Below is shown one of the refuse conveyor feeders of this Detroit RotoStoker, with hood opened to show the horizontal conveyor and feed control roll.



DETROIT STOKER COMPANY

General Motors Building • Detroit 2, Michigan

District Offices in Principal Cities • Works at Monroe, Mich.

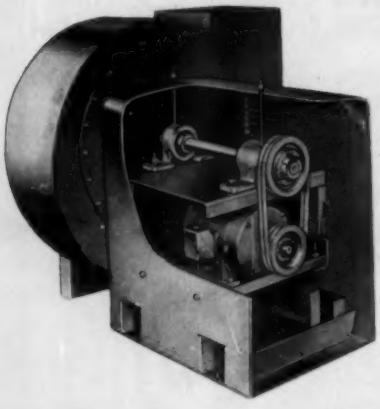
Circle 117 on READ-N-CIRCLE card for more data

new products

. . . starts on page 10

710-Package industrial fan

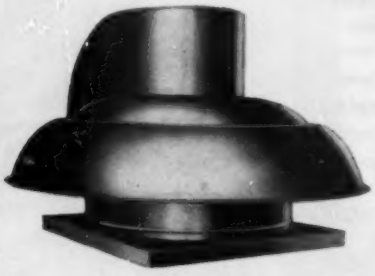
Package industrial fan that comes in a completely self-contained unit



eliminates need for separate motor foundation and minimizes floor-area requirements. Unit also simplifies installation. Wheels for materials handling only are standard with these units, although air-handling or long-shavings wheels can be supplied on special order. Available for volumes to 23,000 cfm at static pressures to 10 inches. They can also be obtained with wheel diameters to 45 1/8 inches and inlet diameters to 26 inches. Outside end panel is removable for easy access to interior. AMERICAN BLOWER CORPORATION.

712-Less noise with centrifugal roof ventilator

New centrifugal roof ventilator is designed for buildings where pleasing appearance and quiet perform-



ance are prime requisites. Ventilator moves large volumes of air efficiently against static pressures at low speeds — and accordingly at low noise levels. Its large unit exhaust capacity is accomplished at low fan-tip speeds by a backward-curved centrifugal fan. DEBOTHEZAT FANS DIVISION, AMERICAN MACHINE AND METALS, INC.

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 75.

714-Cable tap cuts installation time

Device for making permanent, weatherproof cable taps without severing the cable or stripping leads has been developed. Either coax or single-

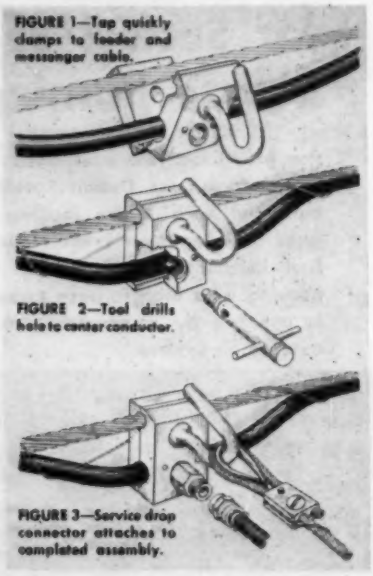


FIGURE 1—Tap quickly clamps to feeder and messenger cable.

FIGURE 2—Tool drills hole to center conductor.

FIGURE 3—Service drop connector attaches to completed assembly.

conductor solid or stranded cables may be used with the tap. Shunt capacitance is held to less than 1.5 mmf. One bolt securely clamps both pressure tap and feeder cable to messenger wire. A special cutting tool is then screwed into tap to pierce outer jacket. Service drop connector is then screwed in, forming a positive, low-loss connection between feeder, conductor and drop. JERROLD ELECTRONICS CORPORATION.

711-Conduit connector gives positive ground

Flexible liquid-tight conduit can now be connected more quickly and safely. The connector, called Liquid-

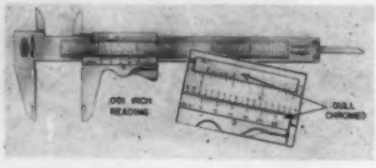
Tite, features one-piece construction to permit installation without need for disassembling the unit. Connector also gives positive grounding, discernible by a definite click. ELECTRICAL FITTINGS CORPORATION.

713-Locking caps and connectors for large size motors

Locking caps and connectors that provide a continuous flow of electricity under the severest shock or vibration conditions, lock easily by an effortless turn. Four wire-20 amp Eagalok caps and connectors for use with three-phase large size motors are interchangeable with other standard locking devices. Available with or without the plated steel armor grounded. Nonremovable, adjustable cord clamps afford absolute strain relief. Connectors have double wire, phosphor bronze contacts securely riveted through bakelite. All devices have large terminal screws and plenty of room for wiring. Assembly screws are anchored in Bakelite. Will not fall out when disassembled. EAGLE ELECTRIC MFG. CO., INC.

715-Vernier caliper has dull chrome slides

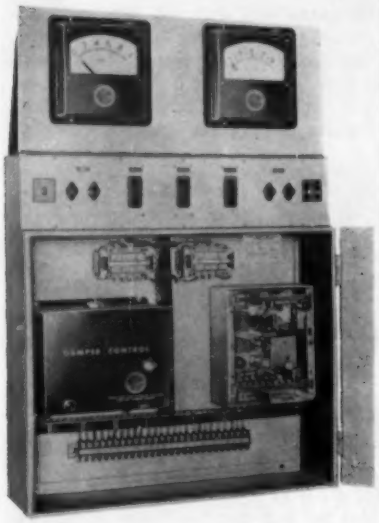
Dull-chrome finished Vernier slides are the latest improvement to the Mauser Vernier Caliper. Now made



of all stainless steel, atmospheric conditions and perspiration will not rust it. Dull-chrome finish on vernier scales eliminates glare and reflection given off by ordinary bright steel giving faster, more accurate readings. Price has not increased. GEORGE SCHERR COMPANY, INC.

716-Panel control systems for automatic burners

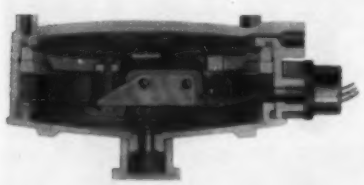
Single integrated panel control systems offer complete burner protec-



tion and fully automatic operation for commercial-industrial oil, gas, and combination oil-gas burners. Features include Fireye flame failure safeguard, programming control, short-circuit protection, motor starters, fuel selector switches, signals, and alarms. Panel unit is prewired and fully tested before leaving factory. Optional equipment includes sequence draft controls, draft and temperature indicators, and provision for switching to modulated or fixed-rate firing. Systems automatically guard every stage of burner operation. ELECTRONIC CORPORATION OF AMERICA.

717-Pressure difference switch operates in any position

Diaphragm pressure switch accurately senses a pressure difference from 0 to 45 inches of water between



a variable and a reference pressure, with a fixed actuation value of 0.5 in. water. Reference pressure must be air or an inert gas, variable pressure may be liquid or gas. Operates in any position—no leveling or special mounting required. BARKSDALE VALVES.

Your plant and equipment suffers . . . your community goodwill fades away. These problems can be solved. Prat-Daniel Collectors are designed for the control of industrial dusts and flyash. Multiple small diameter tubes provide powerful centrifugal forces, resulting in sustained high collection efficiency . . . even with ultra-fine dusts.

Whether the problem is industrial dust or flyash, you are assured of satisfaction with P-D Collector Systems, engineered to meet your specific needs.

Write for Reprint No. 102 titled, "What Type Collector?"

pd

Project Engineers
THE THERMIX CORPORATION
GREENWICH, CONN.
(Offices in 38 Principal Cities)
Canadian Affiliates: T. C. CHOWN, LTD., Montreal 25, Que.

Designers and Manufacturers
PRAT-DANIEL CORPORATION
SOUTH NORWALK, CONN.
POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

Circle 100 on READ-N-CIRCLE card for more data

new products

. . . starts on page 10

718-Speed-change sensing system

New speed-change sensing system for use in precision automatic speed control equipment provides unusual

flexibility and maintenance-free operation with high accuracy and low initial cost. System reacts to speed change as small as .25 percent of its top operating speed. Can be used at any speed up to 80,000 rpm. WESTON ELECTRICAL INSTRUMENT CORPORATION.

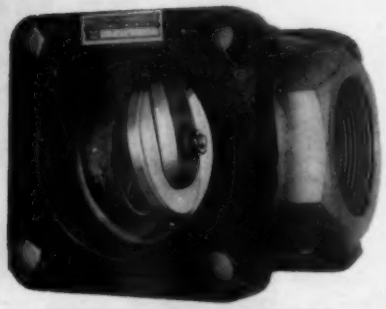
719-Two-hand clutch control increases safety and output

Improved electric two-hand clutch control can increase productivity of manually-operated power machines as much as 20 percent by eliminating

safety worries. Accidental operation is impossible—it can operate only when control system is functioning properly. MICRO SWITCH DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR COMPANY.

720-Sight flow indicator positively checks backflow

Bull's Eye Check Valve Indicator has a self-aligning soft-seat flapper to prevent backflow. Two ½-inch thick windows on opposite sides of body fitting show clearly whether



or not there is a flow. Windows are removable for easy cleaning. Rugged, through-bolted construction makes indicator suitable for severe service and permits cleaning sight glasses without removing unit from pipeline. FISCHER & PORTER COMPANY.

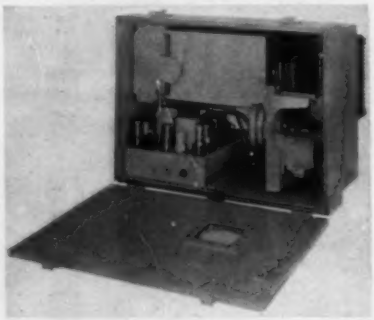
721-Sectional metal storage shelter is portable

Unique portable sectional metal storage shelter tilts, telescopes, and slides apart for easy access. Eight-foot wide prefabricated panels can be

handled by two men. Panels quickly bolt together to form a shelter section. Panels are of all-welded construction and are joined with the aid of an easily replaceable self-fastening extruded double-V rubber seal. Six arrangements available for handling by crane, tilting, and rolling apart. YARD-STOR SHELTER COMPANY.

722-Self-monitoring photoelectric analyzer

New instrument for automatically analyzing, recording, and controlling processes that involve liquids, vapors, or gases will automatically and accurately record over many days without auxiliary attendance. Instrument not only records or controls a process, but periodically and automatically checks and resets itself to compen-



sate for any smudge accumulation on cell windows or other similar sources of error. MANUFACTURERS ENGINEERING & EQUIPMENT CORPORATION.

FREE INFORMATION

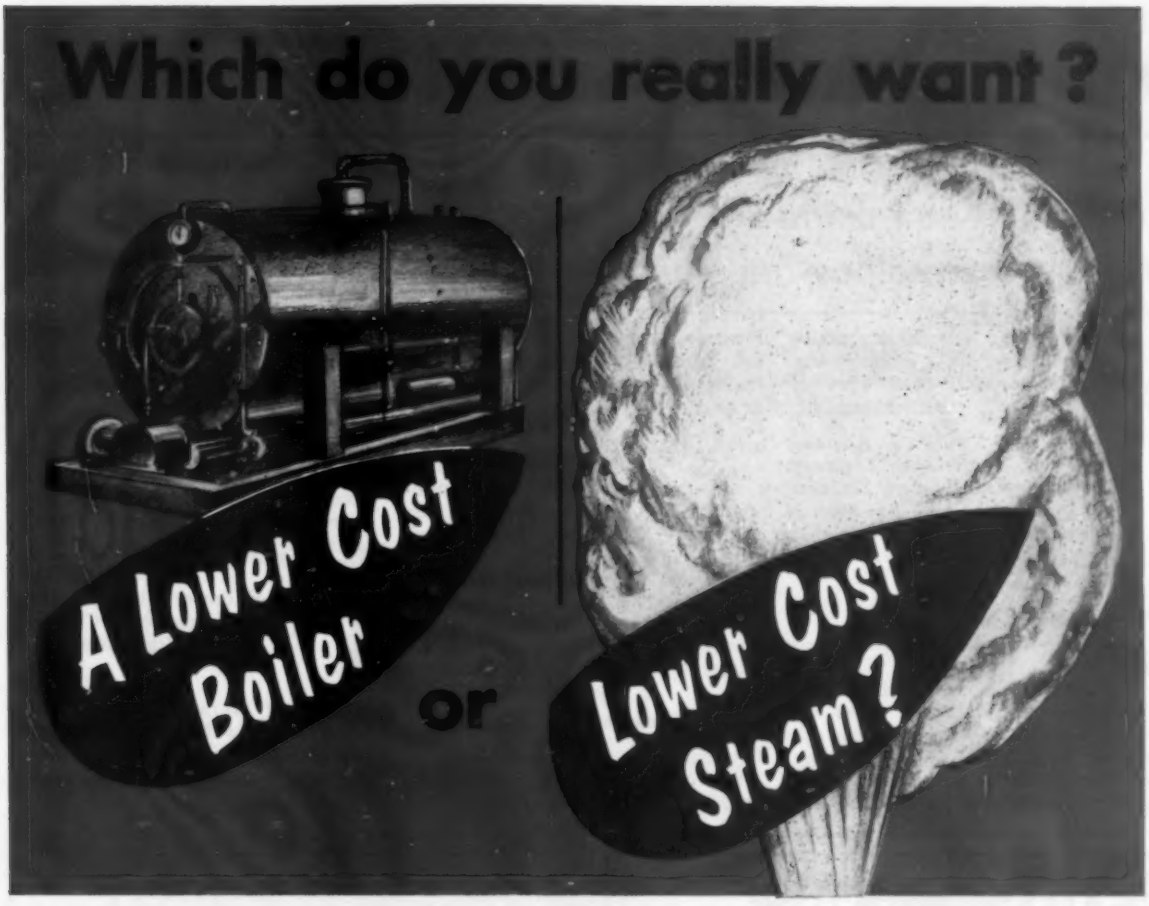
For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 75.

723-Rewind hose reel has simple control

Explosionproof compressed air rewind hose reel for industrial use is easy to install and maintain. New

motor and valve control system simplifies piping arrangement, eliminating need for extra piping and outlets to release compressed air when motor has been stopped. CLIFFORD B. HANNAY & SON, INC.

(more new products on page 84)



A word about price vs. cost

When you come right down to it, a boiler is only as "cheap" as the results it gives you! A low-cost boiler that's unreliable or incomplete is the most expensive one on the market.

That's why we've always built AMESTEAM GENERATORS up to a standard, not down to a price. Throughout our 108 years of building boilers, this policy has paid off in lower-cost steam for Ames customers. It is no coincidence that so many firms specify "AMESTEAM" on the strength of its reputation for reliability and economy of operation. Ames customers are invariably "repeat" customers! They know that lower-cost STEAM rather than a lower-cost boiler is the best buy.

AMESTEAM GENERATOR

20 sizes, 10 to 600 b.p. 15 to 200# Oil, Gas or Oil-Gas Combination.

MAIL COUPON TODAY

AMES IRON WORKS INC.
BOX F-16 OSWEGO, N. Y.

AMES IRON WORKS
BOX F-16 OSWEGO, N. Y.

Gentlemen:
Please send me further information on AMESTEAM GENERATORS and name of the nearest representative.

NAME.....

COMPANY.....

ADDRESS.....

Circle 106 on READ-N-CIRCLE card for more data

our readers write

. . . to industry & power

Thank you very much

Gentlemen:

Your magazine is without a doubt one of the better trade publications, and we consistently read most of your articles with great interest.

W. J. Koerner
Maintenance Engineer
Plumbing and Heating Division
American Radiator &
Standard Sanitary Corporation
Buffalo, New York

Purpose fulfilled

Gentlemen:

We are giving some thought in replacing our one 300-hp vertical water-tube boiler because of its age and condition. While this change may not materialize for at least two years, in our thought and planning we are inclined to favor package type boilers.

We would very much appreciate having one copy of INDUSTRY & POWER's special report on the "Package Boiler Picture" to broaden our knowledge on the trends of package units.

N. G. U'Halie
Plant Engineer
Mercer Pipe Division
Sawhill Tubular Products Inc.
Sharon, Pennsylvania

• *We are happy to send along reprints of "The Package Boiler Picture" in response to the many requests of this type that we have received.*

Another underway

Gentlemen:

We have followed with increasing interest the Thermodynamic Refresher articles written by Professor John F. Lee and appearing in your INDUSTRY & POWER publication . . . It would be appreciated if you would send five copies each of additional tear-out sheets of the . . . articles in the Thermodynamic Refresher . . .

We also wish to take this opportunity to express our thanks for some very constructive articles throughout your magazine and wish you continued success in publishing more of the same.

B. F. Koch
Chief Power Plant Engineer
The Anaconda Company
New York, New York

• *More of the same, indeed, starts in this issue with the Electrical Refresher. Reprints of the Thermodynamics Refresher are being sent to all requesting them.*

THIS IS THE MURPHY
BALL FLOAT TRAP
LITERATURE AND PRICES ON REQUEST
GUARANTEED
YES...
Guaranteed to eliminate entirely all water and oil from small compressed air installations. Guaranteed as to workmanship and materials, too. Entirely mechanical and automatic. No attention . . . no wear.
½" Pipe Size Only
Murphy knows compressed air. Write for our literature, or state your problem. Our engineers are at your service.
AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYER
JAS. A. MURPHY & CO.
HAMILTON, OHIO, U.S.A.
Moisture Elimination Up To 3000 Pounds Per Square Inch

Circle 129 on READ-N-CIRCLE card for more data

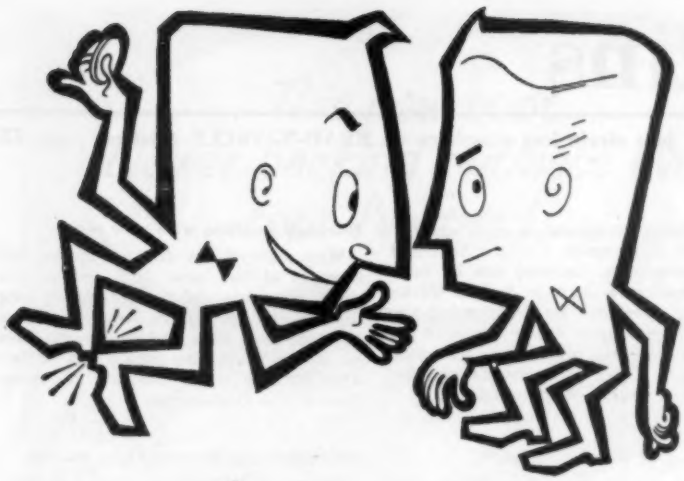
next month in
INDUSTRY & POWER . . . .

nearest thing yet to a completely automatic station

Only five men per shift are required to run Louisiana Power & Light Company's Ninemile Point steam station, which has a total capacity of 325,000 kw. Years ahead of its time, this station points the way to utilization of automation techniques in power generation.

Ninemile Point is an outdoor station, utilizing the very latest in instrumentation, control (including the last word in industrial television), water treatment, color dynamics, corrosion control, building materials, and safety. Every power services engineer will want to read this story. Watch for it in the

February issue of INDUSTRY & POWER

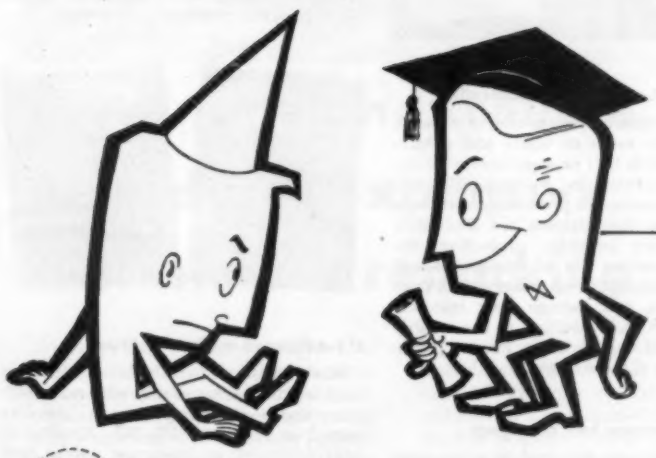


Look! I can buy coal for much less a ton than you're paying.

I used to buy that coal too, but it costs more per million BTU's with a whole lot more in hidden costs.

What do you mean by "hidden costs"?

That coal you're talking about is high in ash. So we were buying ashes at the coal price, paying freight on them from the mine, then paying to have them hauled away. Your "cheaper" coal clinkers; it smokes; it fouls the tubes. That means higher labor costs and higher maintenance. Now I pay more per ton and save thousands of dollars a year.



Coals produced on the C&O are tops in quality.

A C&O combustion engineer showed me why this grade of coal would work best in our type of installation and our experience has shown he was right. You'd better get some expert advice. It can save you money, too.

P.S.

There's a lot more to buying coal than the cost per ton. Why not contact coal producers on the C&O to solve your particular fuel requirements, or write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Company, Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

Circle 115 on READ-N-CIRCLE card for more data

new bulletins

. . . just circle key numbers on READ-N-CIRCLE card on page 75

400-Steam traps for any capacity

Steam traps capable of operating at pressures up to 2500 psi and temperatures up to 1100 F are described in Bulletin SS40B. Includes chart giving capacity of equipment in lbs/hr at differential pressures from 5 to 250 psi. Sectional and dimensional views describe operation and installation. Four pages. STRONG, CARLISLE & HAMMOND CO.

401-Longer life for elevator chains

How service life of elevator chains can be increased from 300 to 400 percent over conventional chains is stated in Bulletin DC-855. Dimensional drawings, tables of physical properties, and relative corrosion resistance for various types of chain metals are included. Full details on drive wheel pitch diameter, bore, and weight are given. Eight pages. BEAUMONT BIRCH COMPANY.

402-Air compressor reference data

Engineering data and dimensional installation drawings are contained in Bulletin L-640-B1C to aid in selecting the proper air compressor for your plant air-supply needs. Complete compressor installation diagram is included along with various cutaway views of major components and accessories. An excellent reference bulletin for any future air compressor installations. Twenty-four pages. WORTHINGTON CORPORATION.

403-Lowdown on oil additives

Oil additives data on all types of fuels and lubricants from gear lubricant additives to viscosity index improvers is contained in this series of bulletins. Contains wealth of data on actual tests, laboratory tests, physical and chemical properties; plus recommendations for storage and transportation. A recommended addition to the technical library of all engineers. MONSANTO CHEMICAL COMPANY.

404-Beat corrosion with Neoprene

Neoprene sprayed coatings and sheet linings are recommended for corrosion and contamination problems described in this bulletin. Neoprene coatings are resistant to oil, abrasion, sunlight, heat, and low temperature. Coatings can be built up in successive coats to desired thickness and vulcanized by steam or hot air. Chemical resistance table covers most common industrial organic and inorganic compounds. Gives recommendations for piping and storing. METALWELD, INC.

405-Can your boiler burn refuse?

Boilers specifically engineered and installed to utilize refuse (such as wood chips and coffee grounds) as fuel are described in Bulletin 55-1. Includes engineering drawings of boilers in capacities up to 5000 lb/hr of steam. Lists complete line of accessories such as economizers, air heaters, and superheaters. Fourteen pages. THE WICKES BOILER CO.

406-Control corrosion cathodically

How galvanic corrosion effects metal in contact with earth or water and principles utilized to halt existent corrosive action are revealed in Bulletin 4078-HC. Resultant savings in protecting both new and existing installations are discussed. Explains how cathodic protection increases operating life of equipment and eliminates downtime on waterworks, deep well pumps, and storage tank installations. Worthwhile addition to the technical library of any engineer. Twelve pages. THE HARCO CORPORATION.

407-Multipurpose belt conveyors

Belt conveyors designed to solve your bulk materials handling problems are described in well-illustrated Bulletin 355. Cutaway sections illustrate lubrication and maintenance features, installation dimensions, and recommendations for spacing and guide rollers. Also lists accessories such as conveyor trippers, discharge spouts, belt cleaners, and impact carriers. Sixteen pages. STEPHENS-ADAMSON MFG. CO.

408-Load handling with wire rope

Wire rope slings that maintain full strength of the rope from which the slings are made and that guarantee long life and extra safety are described in this bulletin. Lists sizes and rated capacities for a variety of wire rope slings. WICKWIRE SPENCER STEEL DIVISON, COLORADO FUEL & IRON CORPORATION.

409-Pocket-size thermocouple manual

Bulletin F 7255 is a convenient pocket-size reference manual for instrument men and engineers. Gives thermocouple temperature-millivolt equivalents. Temperatures are expressed on the International Temperature Scale of 1948, and electromotive force is expressed in absolute units. WHEELCO INSTRUMENTS DIVISION, BARBER COLMAN COMPANY.

410-Cable box buying guide

Cable and splice boxes, with and without armor and conduit fittings plus secondary and primary sectionalizing boxes, both air and oil filled, are presented in detail in Bulletin BB55. Available for cable joints, submarine cable joints, and a variety of configurations to meet every need. Equipment is suitable for use in all power service ranges. An excellent guide for engineers or purchasing agents concerned with the purchase of industrial electrical equipment. Eighteen pages. G&W ELECTRIC SPECIALTY COMPANY.

411-Advanced outdoor lighting

Most advanced methods of lighting large outdoor areas evenly with minimum glare and low operating cost are discussed in Bulletin PL-242. Quality of light delivered, maintenance, safety, and appearance features are some of the salient Plexiglas features discussed. Sixteen pages. ROHM & HAAS COMPANY.

412-Complete chlorination control

Controlled chlorination for purifying water supplies, for treating sewage and industrial wastes, and for slime control are shown in Catalog 70-10. Multi-colored

This new soot blower packing outlasts every type I've tried!
That's J-M CUMPAC® 236- it's specially designed to withstand high temperatures and pressures

Now available at your local Johns-Manville Packing Distributor

saves time and trouble . . . reduces expensive soot blower repacking

YOU MAY HAVE ALREADY discovered that traditional soot blower packings cannot withstand the higher temperatures and pressures employed in boiler operation today. Now, Johns-Manville brings you a new packing specially developed for this service. Cumpac 236 won't harden or vulcanize and greatly outlasts all other packings of the conventional types.

In plants where it has already been introduced, users report excellent results. Soot blower repacking has been reduced to a substantial degree.

How it is constructed: Cumpac 236 resists high temperatures and pressures because it is specially made of high purity asbestos yarn braided over a plastic core of special heat-resistant composition and lubricated with mica. This material is formed into a combination of lip type and solid packing which provides low friction contact with the soot blower tube and seals the entire stuffing box.

Your J-M Packing Distributor carries No. 236 Cumpac sets for all popular soot blowers. He also stocks other Johns-Manville Packings and Gaskets. Ask him for the Cumpac 236 folder, PK-100A, or write Johns-Manville, Box 60, N. Y. 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville PACKINGS & GASKETS

Circle 128 on READ-N-CIRCLE card for more data

new bulletins

. . . starts on page 22

flow diagram shows how chlorine gas and water are kept separate until they reach the ejector system. Additional features include provision for quick change of chlorinator capacity, positive-acting safety devices, simplicity of operation, high accuracy, and ease of installation. Recommendations for installation and operation of chlorinators for all types of service are also included. Sixteen pages. FISCHER & PORTER CO.

413-Continuous temperature readings

Continuous temperature recording, rapid response to temperature change, high stability of reproducibility, and resistance to mechanical shock are features of Rayotube temperature detector described in Bulletin EN-S3. Discusses theory behind heat-radiation measurements of actual surface temperatures and furnace atmospheres, describes Rayotube, and tabulates characteristics of available detectors. One section is devoted to complete assemblies for general applications. Twenty-six pages. LEEDS & NORTHRUP COMPANY.

414-Switchboard selection data

Twelve sections discussing all switchboard selection problems are contained in Bulletin GEA-4127B. Illustrations depict a variety of switchboard installations. Advantages include basic circuits, coordinated design, package units, simplified purchasing, and factory testing. Forty pages. GENERAL ELECTRIC COMPANY.

415-Make stairs and walkways safe

How to repair worn and dangerous stair treads with extruded and cast-metal safety stair treads is explained in Bulletin ST-855. Illustrations clearly describe two easy steps for repairing worn treads in a matter of hours regardless of depth of wear or tread condition. Four pages. WOOSTER PRODUCTS, INC.

416-Sprayed coil dehumidifiers

Water dilution, high humidification, evaporative cooling, and size determination are among the pertinent factors relating to selection of sprayed coil dehumidifiers discussed in Bulletin 7827-H. Included are formulas, tables, curves for accurate selection, and a step-by-step example of how to select a dehumidifier for a given hypothetical application. Optional arrangements and related equipment are also discussed. Twenty pages. AMERICAN BLOWER CORPORATION.

417-Cork for industrial uses

Physical properties of natural cork and physical properties, specifications, sheet sizes, and thicknesses of cork compositions are included in Bulletin S-56. Advantages and possible applications of cork in your operations are also given. Four pages. DODGE CORK COMPANY, INC.

418-Limited space for heating?

The answer to the question of providing heat within limited space is contained in Bulletin 256. Includes technical data comparing equivalent surface areas of Thermo-Panel to pipe coils. Thermo-Panel plate coils may be obtained in sizes as thin as 17/32 inches in the single embossed type. Can be adapted for heating many corrosive liquid baths. Handles, hanger brackets, surface treatment, edge sealing welds, and other accessories are also included. Four pages. THERMO-PANEL DIVISION, DEAN PRODUCTS, INC.

419—Electric motor library

Over 900 motors in practically every conceivable size and shape, originally designed for special jobs, are listed in this bulletin. Principal purpose of the library is to save motor purchasers unnecessary expense and delay. All motors have been field tested and proved practical in actual usage. REULAND ELECTRIC COMPANY.

420-Cable supports adjust easily

Answers to your cable-supporting problems using quick-coupling channel connectors are given in Bulletin 855. Supports—trough, ladder, and channel—in lengths up to 16 feet are available. Channel connectors, fastened with drive rivets for quick assembly, provide extra strength at connection and eliminate cutting and drilling in the field. Available in widths from 1 to 24 inches. Four pages. P-W INDUSTRIES, INC.

421-Answers about clarifiers

Clarifier and thickener requirements for a wide range of capacities and solids removal loads are listed in Bulletin W-800B-S-6000B. Presented in question-and-answer form, bulletin explains need for and function of circular sedimentation basins, sludge scrapers, and central inlet wells. Sixteen pages. INFILCO INC.

422-Versatile car switching units

Heavy-duty Trackmobile hauls, switches, and spots railroad cars. Operates on both paved road and track. Converts from road to rail wheels in only 90 seconds. Unit can develop as much as 12,800 pounds of draw-bar pull, and can double as a road tractor inside the plant when not in use switching railroad cars. Bulletin T-115. Sixteen pages. WHITING CORPORATION.

423-Insulation, refractory handbook

Engineering data, formulas for calculating heat transmission, tables on heat losses from bare surfaces, and equivalent thicknesses of pipes are a part of the technical information contained in Bulletin IP-36A. Also includes descriptions of physical properties of the complete line of products. An excellent handbook containing information on all insulation and refractory problems. Fifty-two pages. JOHNS-MANVILLE.

424-Plastic pipe handbook

Threaded- and socket-type fittings and flanges in both normal and high-impact grades are included in this bulletin. Includes installation information, pressure-temperature charts, chemical resistance tables, and other reference data. Polyvinyl chloride pipe material is resistant to corrosion, inert, non-toxic, easy-to-install, and light weight. TUBE TURNS PLASTICS, INC.

425-Butterflies are tight closing

Minimum space requirements, drop-tight performance, and agreement with AWWA design specifications are features of rubber-seated butterfly valves described in Bulletin 650-L1B. Bulletin also

includes design information on valve sizes, components, types of operators, and accessories. Valves require no support other than the pipeline itself, and are suitable for tight shutoff as well as throttling service. Four pages. BUILDERS-PROVIDENCE, INC.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 75.

426-Electric conductor data

Engineering data on laboratory tests and service records covering performance of electrical conductors are contained in engineering Bulletin EB-27. Operating temperatures, dielectric strength, aging, insulation resistance, moisture absorption, and power factor are discussed in detail. Descriptions of the many installation procedures are also included. ANACONDA WIRE & CABLE COMPANY.

427-Facts on private telephones

How company-owned telephone systems sharpen efficiency, conserve manpower, and eliminate misunderstandings is discussed in Bulletin 1769. Demonstrates how departments in every corner of a typical plant are linked to provide fast, reliable, automatic telephone communication entirely separate from the city system. Lists five benefits resulting from company-owned telephone communication facilities. Four pages. AUTOMATIC ELECTRIC CO.

428-How to save money on fuel

How to short-circuit trouble, improve operation, and effect substantial savings in your plant are discussed in this bulletin. Lists 10 services that alert steam plant operators are using to effect maximum efficiency. Lists three major sources of hidden waste and loss, with comprehensive discussion of remedial measures. Includes reply card for obtaining information on 25 case histories. Four pages. FUEL ENGINEERING COMPANY OF NEW YORK.

429-Fire protection primer

Bulletin P8R8 describes type of fire-fighting equipment used to extinguish Class A, B, and C fires and lists capacities

(more new bulletins on page 72)

Expect 5 to 8 YEARS protection

for galvanized towers from a

SINGLE COAT OF SUBOX

There's no better anti-corrosive pigment for painting over galvanizing than active suboxide of lead—the basic pigment in Subox and Subalox paints.

There's no surer way to get economical and effective preservation of galvanized structures than by coating them with Subox or Subalox. In most instances, a single coat is sufficient and Subox or Subalox—will not chip, crack or blister during years of exposure to the elements.

What's more, repainting is simpler and more economical when these paints are used. They cost no more than any good paints, and can be relied on to save you money for years.

Write for a free copy of "Corrosion Control of Electrical Structures and Equipment."

Subox Inc. 9 FAIRMOUNT PLANT HACKENSACK, N. J.

Circle 110 on READ-N-CIRCLE card for more data

When an

ICE STORM CAUSED SINGLE PHASING

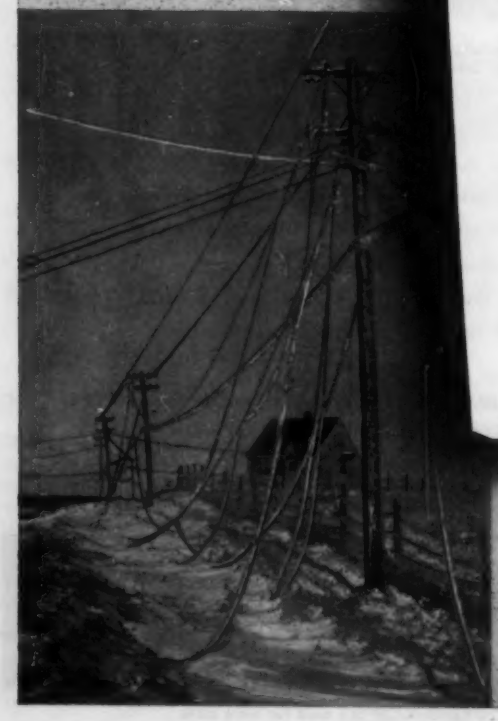
and low voltage conditions . . we blew a flock of Fusetron fuses but we saved over 40 motors from burnout

"For twenty-four hours after the bad ice storm of February 15, 1950 we were endangered by single phasing and low voltage conditions due to the damage done the power lines by the ice.

"During this period, we blew a flock of Fusetron dual-element fuses—around 240 in fact—but we figure that was a very cheap price to pay for saving over 40 motors from burning up.

"After this experience we didn't lose any time in putting all of our plant and equipment under Fusetron Fuse protection."

Michael G. Kupcho,
Master Mechanic
Ashland Shirt and Pajama Company
Ashland, Pennsylvania



You too, can be safe from electrical hazards by using

Fusetron DUAL ELEMENT Fuses

They provide 10 Point Protection

1. High interrupting capacity—protect against heaviest short-circuits. Have proven on tests to open safely on circuits set to deliver in excess of 100,000 amperes.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating—lesser resistance results in cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

Write for bulletin FIS.

DON'T RISK LOSSES — *Start today to install FUSETRON fuses throughout the entire electrical system!*

FUSETRON

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION

BUSS

For loads above 600 and up to 5,000 amps., . . . use BUSS Hi-Cap Fuses . . .

They have unlimited interrupting capacity to handle any fault current regardless of system growth.

Overload protection as well as short-circuit protection.

Coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuits of origin.

Dependable service through the years because there are no moving parts to stick or get out of order.

Write for bulletin HCS.

BUSSMANN MFG. CO. (Div. of McGraw Electric Co.) St. Louis 7, Mo.

Circle 111 on READ-N-CIRCLE card for more data

ideas in action

. . . for industry & power

Forget steam hose failures

Ordinary flexible hose on batteries of 100-ton French presses at Pro-phy-lac-tic Brush Company, division of Warner-Lambert Pharmaceutical Company, had to be repaired after three months of use. The hoses feed steam at 170 psi and 340 F to the rams and beds, to keep the plastic molds at a uniform temperature. Because the hose constantly flexes (presses move up and down on a 50-second cycle for about 22½ hours a working day), maintenance engineers found that hose maintenance was excessive.

About three years ago, a new type of hose assembly

manufactured by Resistoflex Corporation — known as Resistoflex R-3800—was tried out. Hose tube is made of a smooth, specially extruded fluorocarbon resin jacketed in stainless-steel wire braid. This reinforcement has high corrosion resistance and tensile strength, resists fatigue, and provides a blowoff-proof anchor for the couplings. Three-piece steel couplings slip over the hose, and are swaged directly on the steel jacket. The hose assemblies are still tight and completely leak-free, and have been completely unaffected by either steam or flexure during the three years.

Metallizing beats flood threat

Metallizing beat an emergency when Shawinigan Water and Power Co. of Quebec, Canada recently shut down a 10,000-hp vertical hydro-electric unit to clean the generator winding and to do some cooling-water piping. After the rotor was lifted, the thrust collar was found to be loose and out of alignment. Also, the vertical key that holds the collar in place on the shaft had started to roll in the keyway. Thrust collar on a vertical hydro unit supports the Kingsbury bearing which, in turn, supports the combined weight (in this case, about 85 tons) of generator rotor, shaft, and turbine runner. The overhaul was being done some six weeks prior to the spring flood period—so time was at a premium. With no stop-logs in the tail-race to cut water flow and with a dismantled turbine on their hands, a flash flood would have been extremely serious.

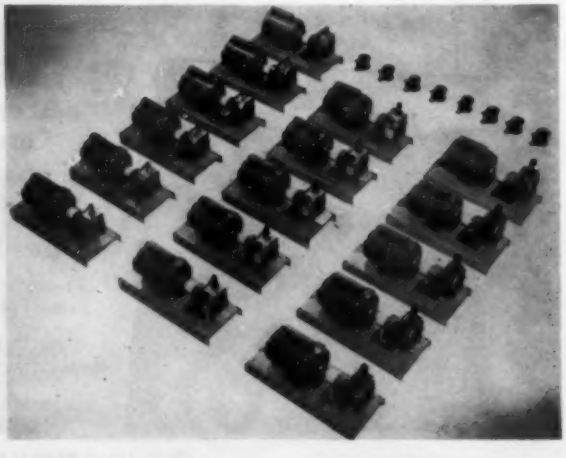
Inner diameter of the thrust collar could not be built up by applying chromium or nickel by electroplating, because the work would have had to be done outside, and delivery could not be promised in time. With this in mind, it was decided to metallize. The thrust collar was first set up in a large lathe and bored true. Eight V-threads to the inch were then cut on the inside. This was followed by roughing with a rotary-shaft preparing tool. About .003 inches of molybdenum was applied for additional bonding. Build-up was completed with .25 carbon steel, sufficient to allow for finishing. A metallizing gun with a 24-inch extension and angular air cap was employed for the entire metallizing job. The whole job was completed in only two working days, in spite of the fairly small inside diameter.

Industrial television is a teacher

Industrial television's effectiveness as a classroom medium for teaching techniques to large student groups has been demonstrated by the Temple University School of Dentistry and the Radio Corporation of America in a four-hour television clinic recently held in Philadelphia. Demonstrations of advanced procedures, caught in close-up detail by an RCA ITV camera mounted over the patients, were projected by closed circuit to six 21-inch television receivers in the demonstration room. More than 50 students got a closeup view, indicating that closed-circuit television is a practical, economical medium for giving specialized instruction to large groups.

Atomic energy demands many resistant materials

There is no best material when it comes to handling corrosives involved in atomic energy operations. A single shipment of "flex-i-liner" pumps, manufactured



by Vanton Pump & Equipment Corp., to an AEC installation on the west coast, illustrates this point quite clearly. The 16 pumps shipped included 6 models with stainless-steel housings and Neoprene flexible liners, 5 models with polyethylene housings and Neoprene flexible liners, 5 models with Buna N housings and Buna N flexible liners, 12 spare Neoprene liners and 6 spare Buna N liners. Since housing and liner are the only parts of the pump that contact the fluid being pumped, the other components are not vital. But, to protect against possibility of liner breakage, all pumps are equipped with stainless-steel rotors and shafts, and bearings are completely enclosed in stainless housings.

Waste atomic heat used for first time

For the first time in this country, tremendous quantities of waste heat generated by atomic reactors are being used for large-scale space heating. General Electric engineers at the Atomic Energy Commission's Hanford atomic plant are transferring heat from atomic reactor cooling water to air conditioners in various buildings.

Entire system is expected to save $59,000 annually in fuel costs, although the initial investment (about $614,000) is more than would be needed to construct a conventional heating plant. Added cost for atomic heating is $444,000, but savings over a few years will defray this extra initial expense. Plant buildings to be heated use about 168,000 cfm of outside air.

River water is pumped through the reactors, where it absorbs immense amounts of heat and picks up slight amounts of radioactivity. It is then pumped to a heat exchanger. Here it gives up its heat to an ethylene glycol solution, which transmits the heat to air conditioning systems in various buildings. The water is held until its radioactivity level is decreased to a point where it can be safely discharged to the river. Higher pressure is maintained in the secondary (or ethylene glycol) system than in the system pumping water directly from the reactor. If a leak should develop, the flow would be from the nonradioactive fluid into the radioactive fluid.

Add 26 radial engines to Texas plant

To provide additional electric generating capacity for their massive smelting works at Point Comfort, Texas, the Aluminum Company of America recently purchased 26 additional 2125-hp spark-ignition gas-burning radial diesel engines from Nordberg Manufacturing Company. These units will give Alcoa a total of 220

A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

A Few of MANY Reasons:

• Operating Life Is Practically Unlimited
A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This simpler magnetic link eliminates mechanical parts subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol.*

• Customized Corrosion Control
Floats can be fabricated from a variety of materials to meet any "special" local corrosion problems. Type 304 stainless steel floats have proven over the years to have the greatest all-around corrosion resistance, and so are furnished as standard.

• "No-Scale" Float Chamber Liner
Exclusive self-cleaning brass liner actually "flexes" off corrosion—prevents scale growth and "sticking" of float.

• Up to Three Switches—an Exclusive Safety Feature
Only MAGNETROL design can provide up to three completely separate switch mechanisms, each operating at its own level, in a STANDARD control. Use extra switch for "stand-by" pump for emergency use; or alarm BEFORE fuel cut-off; or high level alarm; etc.

• Least Maintenance
Once-a-shift blow down and once-a-month visual inspection of switch housing are only regular maintenance. *Built SAFE, Magnetrols stay SAFE.*

We offer STANDARD Magnetrol Boiler Water Level Controls for service at temperatures up to 750°F., at pressures up to 600 psi., for single stage or multi-level stage service with up to three separate switching actions. Special units available for more extreme requirements.

MAGNETROL, Inc. Mail the Coupon Now for Full Facts

MAGNETROL, Inc., 2130 S. Marshall Blvd., Chicago 23, Ill.

Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 102 on READ-N-CIRCLE card for more data

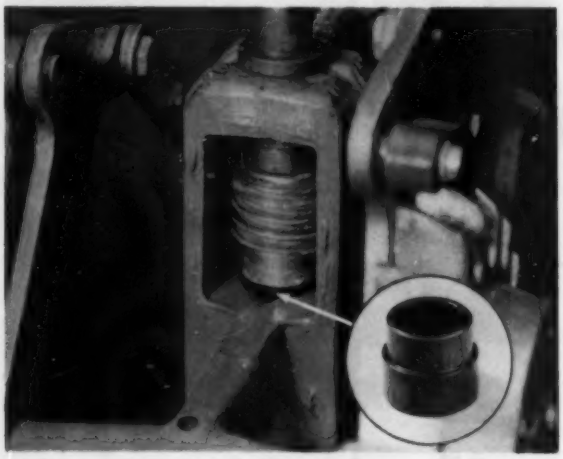
ideas in action

. . . starts on page 28

Nordberg radials with a maximum capacity of over 400,000 hp at Point Comfort. This is now the world's largest internal combustion engine power station by far. Eleven new engines have already been shipped by barge from Milwaukee docks to the installation site on the Gulf Coast of Texas. Engines weighed 32½ tons each.

Sintered nylon bearing reduces friction

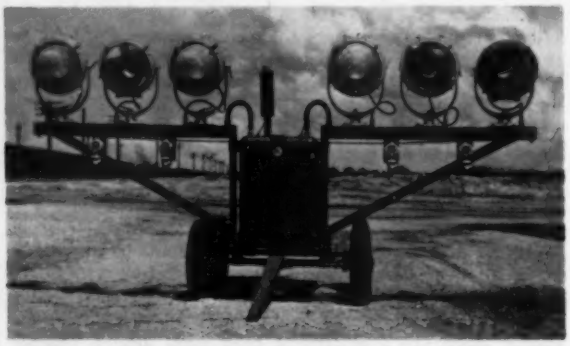
Unusual low surface friction with dimensional stability are advantages of parts made from a new type of nylon powder filled with graphite. Parts are made by cold-pressing and oil-sintering the powder on equipment somewhat similar to that used in powdered metallurgy processes. Bushings made from nylon powder known



as Nylasint Type 66-6G, distributed by National Polymer Products, Inc., provide an extremely low coefficient of friction where no lubrication is desired. Graphite filler acts as solid internal lubricant. Shafts turn easily and smoothly. The bearing can replace a three-piece assembly consisting of an oil-impregnated bronze bearing, a cork washer, and a graphite bearing.

Portable floodlighting aids refinery maintenance

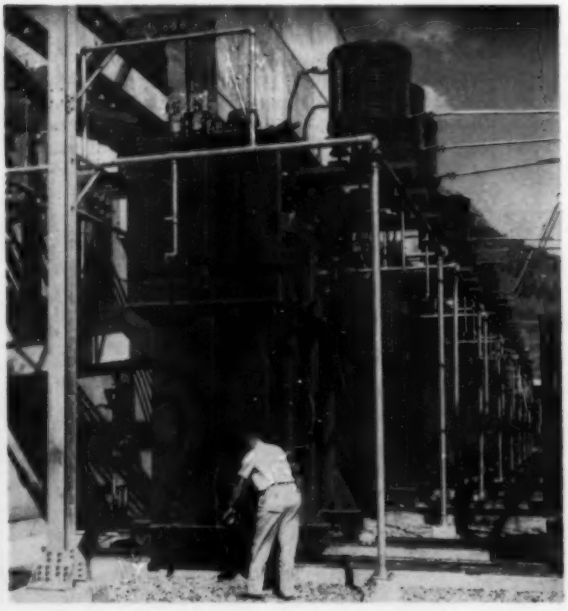
Portability is the key to efficient floodlighting used at Sohio Petroleum Company's Covington, Kentucky refinery to provide safe, adequate lighting during cleaning or repair operations of storage tanks and other structural equipment. Two portable floodlighting setups are used. For emergency lighting, and as a source of illumination for general outdoor maintenance work, a 7.5-kw portable generator equipped with six Crouse-Hinds nonexplosionproof floodlights are used. Three floodlights on each side of the generator are mounted on wing girders. By positioning the portable power unit between two refinery tanks and leaving the wing girders in a closed position, lighting is provided for two maintenance crews. By swinging the girders out a full 90 degrees, a lighting bay is formed that delivers 35 foot candles of light over the surface of an object 50 feet away. Generator is also equipped with four explosion-proof plug receptacles to feed power to other electrical



equipment at the refinery, such as the battery of four explosionproof floodlights used during cleaning operations to illuminate tank interiors. Power to floodlights inside the tank is fed by cable from the portable generator through a manhole in the tank top. This internal illumination is sufficiently intense to permit thorough inspection of tank seams when necessary.

Water cooling saves space

First water-cooled rectifier transformers ever used on an aluminum pot line are serving the Anaconda Aluminum Company's two new pot lines at Columbia Falls, Montana. By using the Westinghouse water-cooled units instead of the previous self-cooled ones, transformer floor area is reduced to less than half, weight is decreased 35 percent, and first cost is less. Sixteen rectifier transformers are used in this installation, eight for



next month in
INDUSTRY & POWER....

why not try simplicity?

Simplicity in the design and selection of control systems for Industry's Power Services most often leads to the best solution of the problem at hand — at least cost. Too often in these days of great automation-consciousness, there is a tendency to over-engineer control systems to the point where the virtues of simplicity are forgotten.

Chester Beard, author of INDUSTRY & POWER'S famous "Special Report on Control Valves and Positioners," shows how to put simplicity into your control systems. Read the full story next month in the

February issue of
INDUSTRY & POWER

you can still get
I&P's special report on

contaminants in the air

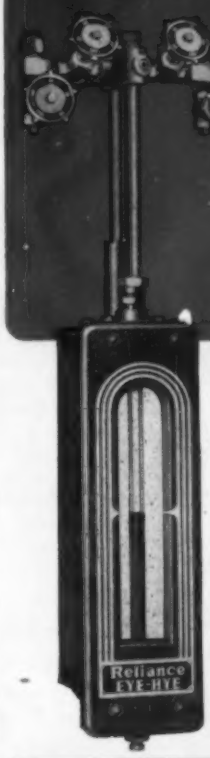
A most comprehensive report, "Contaminants in the Air" covers basic definitions of the problem, legal implications, measuring techniques, specific tools, and fundamental methods for licking industry's principal air contaminants.

To meet the continuing demand for this special report, reprints are made available to all readers. Single copies are free; 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies 10¢ each.

Address all orders to

Reader Service Dept.
INDUSTRY & POWER
Commercial Bank Building
St. Joseph, Michigan

Check your boiler water levels
with the
completely hydrostatic
Reliance
EYE-HYE
Remote Reading Gage

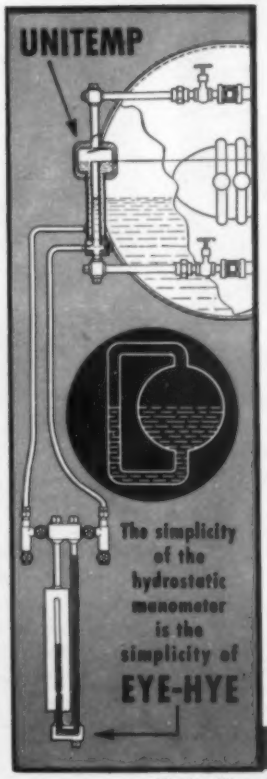


Simple as A-B-C, yet accurate, safe, dependable

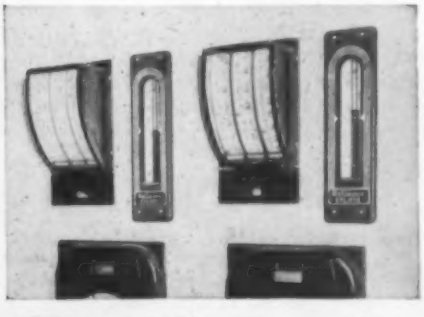
Make your boilers and power plant safer from water level failure. Use an EYE-HYE on each boiler. Engineers can't miss seeing this reliable, accurate device that carries water level reading to panel or convenient wall position.

Simplicity is the secret of EYE-HYE's dependable full-range accuracy — all hydrostatic operation, no mechanical working parts. Factory-calibrated to your water level range and working steam pressure — cannot be tampered with. Nothing to adjust during installation. Easy to install, practically no maintenance. Complete "Unitemp" temperature equalizing unit is furnished with each EYE-HYE.

Reliance EYE-HYE is a familiar sight in thousands of power plants. Models for any remote gage need — any pressure. Write the factory or nearest Reliance Representative for Bulletin CO.



The Reliance Gauge Column Company
5902 Carnegie Avenue • Cleveland 3, Ohio



Reliance
BOILER SAFETY DEVICES

Circle 103 on READ-N-CIRCLE card for more data

ideas in action

. . . Starts on page 28

each of two 100,000-ampere, 700-volt pot lines. Each 10,200-kva transformer takes power at 13.8 kv and feeds it into a 12,500-ampere Westinghouse ignitron rectifier unit at 700 volts. Eight rectifiers in parallel supply the 100,000-ampere pot line.

All-plastic spray header

Spray header system that uses 82 feet of Koroseal high-impact rigid pipe will be installed at a West Coast aircraft plant for metal-bond cleaning of airframe parts. Exterior exposure to acid would cause metal piping to corrode. Rectangular-shaped spray system, using pipe

from 3-inch to ½-inch I D, will also use Koroseal rigid Tee's, reducing bushings, elbows, caps, and companion flanges fastened with machined Koroseal nuts and bolts. This material is replacing carbon steel, copper, cast iron, and stainless steel wherever corrosion is a problem. It weighs about a fourth as much as standard metal pipe.

More safety with less sound

Safer working conditions are being obtained from a 97-percent reduction of the sound energy generated by ball-mill grinding at the St. Louis plant of Mallinckrodt Chemical Works. One operation at the plant (owned by the Atomic Energy Commission and operated by Mallinckrodt) involves ball-mill grinding of a fused slag material. Prior to sound treatment, noise levels around the ball mill were approximately 108 decibels—far above recommended maximum. Soundmetal Panels, a product of Industrial Sound Control, Inc., now enclose the area. These panels, 3½ inches thick and containing spun lead and zinc fibers, reduced the noise level around the ball mill to 99 decibels. Noise level without the ball mill operating is 98 decibels.

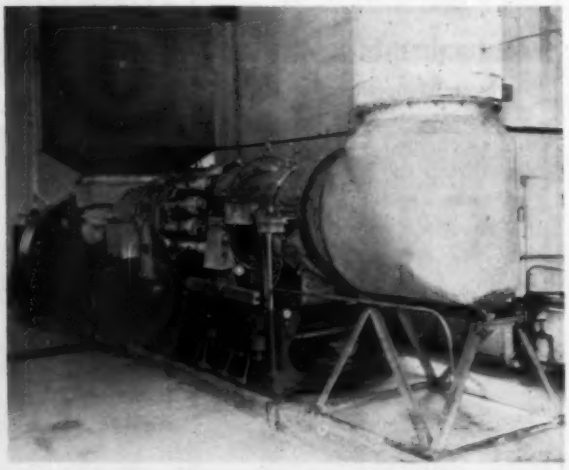
New argon-hydrogen mixture replaces helium for welding

Inert gas-shielded welding slowdowns sometimes occur when argon shielding is substituted for helium in some applications, principally stainless steel. A new shielding gas for electric welding—H-15 Argon Mixture—has been developed by Linde Air Products Company, a Division of Union Carbide and Carbon Corporation. Mixture has been used successfully to shield Heliarc welding of stainless steel, Monel, Inconel, and other metals. X-ray testing of the welds has shown that resulting joints are sound and clean.

Besides giving excellent weld quality, presence of hydrogen in the mixture permits relatively high arc voltages, resulting in high speeds. Main economic advantage of the mixture is the substantially reduced flow rates for adequate shielding of the weld zone compared to the volume of helium needed.

Gas-turbine power plant

America's first municipal gas-turbine power plant has gone into service for the City of Larned, Kansas. Westinghouse Electric Corporation built the 1250-kw unit, which is completely self-contained. It requires no boiler or other external heat source, since it burns fuel and



converts the heat energy into electricity in one assembly. It operates at 8750 rpm, and is connected to the 1563-kva, 1200-rpm generator by a single-reduction, double-helical gear. Unit is simple, open-cycle type. It is only 35 feet long, 6 feet wide, and 6 feet high, and weighs about 41,000 pounds. It is equipped with a dual-fuel system for burning either natural gas or distillate oil. Either fuel can be used for startup. Fuel changeover under load can be

(more ideas in action on page 78)

Industry & Power • SERVING INDUSTRY'S POWER SERVICES

ESTABLISHED MAY 1920

EDITOR AND PUBLISHER
JOHN PAUL TAYLOR

EDITOR
HAROLD A. BERGEN

ASSOCIATE EDITOR
DONALD HARTLEY

ASSISTANT EDITOR
ROBERT W. DE MOSS

EDITORIAL ASSISTANTS
M. J. HOLT
M. B. PRATT
D. M. ADKINS

PRODUCTION
ALFRED T. THORNYCROFT,
Manager of Publications
J. R. JEWELL
R. H. GIBNEY

MARKET SERVICES AND CIRCULATION
VINCENT F. DONOHUE,
Manager of Market Services
L. A. CRABTREE
E. G. DLOUHY

SALES REPRESENTATIVES

New York
Ransom P. Reynolds
11 West 42nd Street, New York, N.Y.
OXford 5-1495

Philadelphia
David L. McKechnie,
William E. Carr
816 Lancaster Ave., Villanova, Pa.
LAwrence 5-4692

Cleveland
Fred S. Brandt
3292 Daleford Rd.,
Shaker Heights, Ohio
SKyline 2-1649

Chicago
Tom Barron
360 N. Michigan Ave., Room 614
DEarborn 2-3519

Los Angeles
Justin Hannon
4710 Crenshaw Blvd.,
Los Angeles, Calif.
AXminster 2-9501

EPA NBP

The John Paul Taylor Publishing Co.
Commercial Bank Building
St. Joseph, Michigan

this month's comment - -

progress is tradition

You see in this issue marks of progress and of tradition—a combination we like to think of as a guidepost for INDUSTRY & POWER. Progress is marked by the appearance of our new cover. Tradition is marked by our Review and Forecast starting on page 35. We like this *combination* of progress and tradition because we feel that progress *must be* a tradition for any enterprise that is to remain healthy. Tradition that does not include progress is, in fact, nothing more than stagnation.

It is our good fortune to know several power services engineers holding responsible positions in firms that enjoy heritages of sound tradition. And the fundamental job of these engineers is to keep their power services ready for the change that marks progress—change of product, of manufacturing technique, of energy-delivering media, of power source. They keep their plants alert to constant change. Most anticipate major change in a given facility within two years of the last major change. Some expect it in six months.

Whether we care to acknowledge it or not, change appears to be a permanent part of the industrial scene—giving us frequent opportunity to make progress a tradition. Federal Power Commission figures, for example, show that generation of electric power by industrial firms for their own use will double by 1975. Generation by utilities will go up some 2½ times by 1975, half of that generation going into industrial plants. Does this not portend change for Industry's Power Services? Does this not point to opportunity to weave progress into the tradition that will be abuilding during the coming 20 years?

We intend to report the growth of Industry's Power Services as it develops. In our own efforts to produce publications worthy of your attention, we intend to share with, as well as to report, the tradition of progress in this engineering domain we share with you. In so doing, we hope to help you in your chore of weaving progress into your tradition.

That is why we call your attention to this issue as one marking a particularly significant combination of progress and tradition. For we want you to feel that our new cover will be introducing to you a traditional part of your reading.

Harold A. Bergen

Editor

YARWAY picked for "Preferred" Steam Generators

This installation of Preferred Utilities Mfg. Corp. packaged unit steam generators at a high school in New York State features YARWAY Blow-Off Valves as part of the "package".

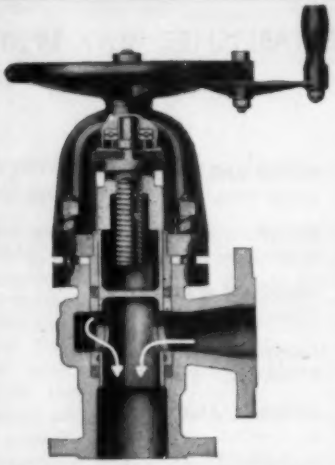
Not only Preferred Utilities, but many other leading manufacturers of package-type boilers now furnish YARWAY Blow-Off Valves on their units. YARWAYS make a *good* package boiler *better*.

The YARWAY Seatless Valve gives drop-tight shut-off and also eliminates the commonest source of blow-off valve trouble. *There is no seat to score, wear, clog or leak.*

Whatever make boiler you use, specify that the blow-off valves be YARWAY *Seatless*. More than 16,000 boiler plants use YARWAY Blow-Off Valves—some for 35 to 40 years.

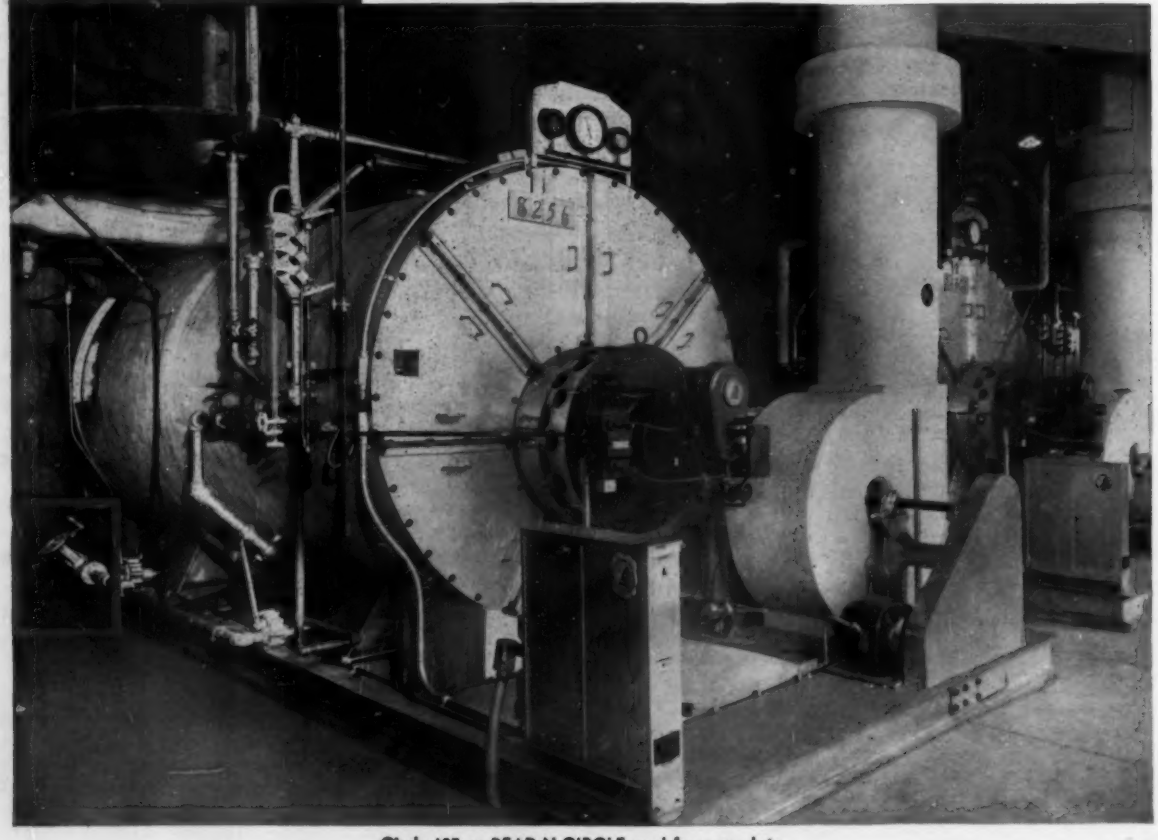
Write for full details in Yarway Bulletin B-426.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES



Yarway Type "B" Seatless Blow-Off Valve shown in open position. Note balanced, sliding plunger design. There is no seat to score, wear, clog or leak. Pressures to 400 psi.

YARWAY **BLOW-OFF VALVES**



Circle 105 on READ-N-CIRCLE card for more data

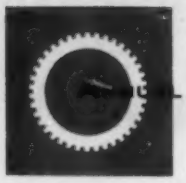
Annual Review and Forecast

Industry & Power

How does your plant stack up against today's best practice—and how will it stack up tomorrow? With INDUSTRY & POWER'S Annual Review and Forecast, you can examine your facilities in the light of present trends. Discover trends now in motion so that you can integrate them with your own planning for the future. Many readers have used INDUSTRY & POWER'S Review and Forecast Issues as documentary background in presenting requests to top management to improve their own power services.

Carefully read the pages that follow, and see how well your plant stacks up now. Then, lay out a plan of action that best serves your needs. We hope our Review and Forecast will be for you a significant beginning.

Front cover photograph: Champion Paper and Fibre Company



REVIEW AND FORECAST

Steam

Temperature and pressure pace developments in steam equipment.

TEMPERATURE AND PRESSURE continue the topics of utmost concern in steam generation and distribution. Already completed research predicts attainable pressures in the supercritical range of 10,000 psi. The first commercial supercritical boiler, being built by Babcock & Wilcox for American Gas & Electric's Philo plant, is designed to produce steam at 4500 psi and 1150 F. This unit will demonstrate the advantages of supercritical units: higher efficiency, elimination of steam drum, and resulting compactness.

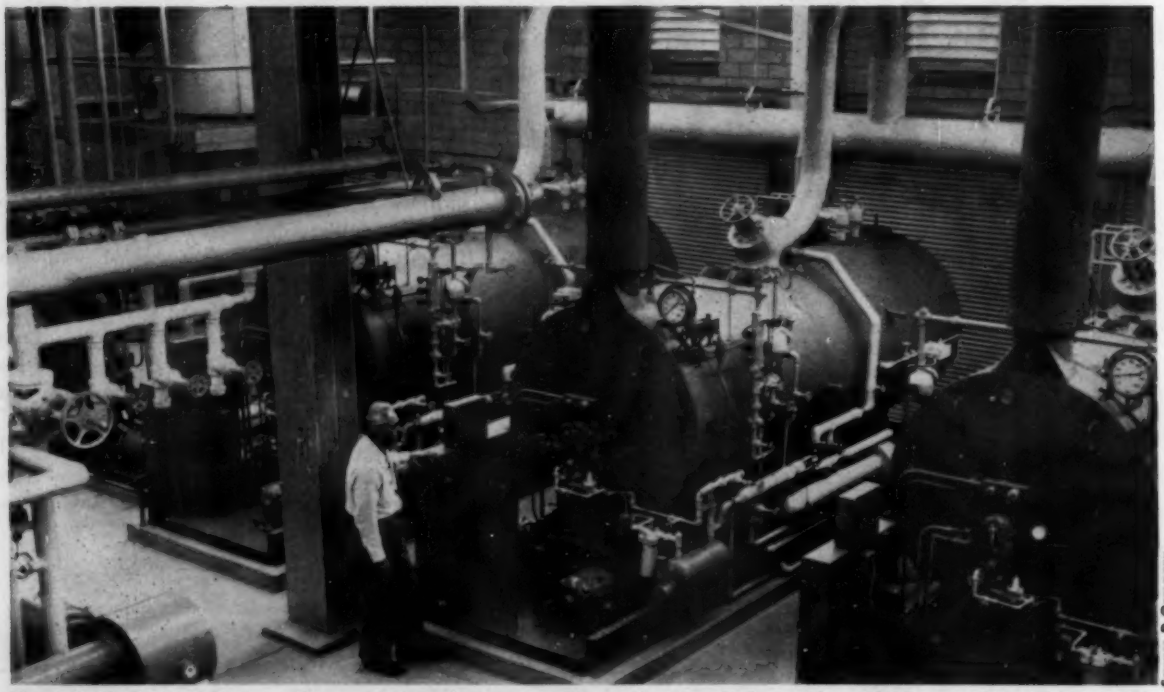
A second supercritical unit has been ordered by Philadelphia Electric Company, to be installed in a new station at Eddystone, Pa. This boiler, being built by Combustion Engineering, will deliver steam to the turbine at 5000 psi and 1200 F. It will serve a 325,000-kw turbogenerator.

Interestingly enough, the supercritical Philo boiler is being designed to operate below critical conditions, too. It is, therefore, called a Universal Pressure Unit. This illustrates growing attitudes of caution that are rising up to arrest some of the enthusiasms responsible for higher and higher leaps beyond the critical. While interest in supercritical units is continuing, more attention is being given now to increasing plant efficiencies by means other than entering the supercritical realm.

Several factors beside steam pressure and temperature are receiving attention as alternatives to going "supercritical." These include tube configuration, input rate, medium velocity, feedwater treatment, fuel-burning equipment, steam purification, and alloy materials.

Super pressures, nevertheless, are coming in not only for power generation, but for process applications as well. Spurred by the petrochemical industries, broader use of pressures above 5000 psi is in the offing. Pilot plant research workers are already calling for 30,000-psi steam from their power-services engineers. Pressures exceeding 100,000 psi are being considered by advanced researchers.

Another new trend in the offing is the contemplated combinations of steam and gas turbines for both new and old plants. Three output products from a gas turbine would be used: shaft power, compressed air, and exhaust gas carrying a ma-



Square D Company

Typical of the installations demonstrating the continued popularity of the package boiler is this boilerroom in the recently completed Cedar Rapids, Iowa plant of Square D Company. The boilers were made by Cleaver-Brooks.

jor portion of its original oxygen. Four means of extracting power from such a combination are proposed: turbine exhaust could heat feedwater; turbine exhaust could generate steam in a heat recovery boiler; exhaust could be used as highly preheated combustion air, since it still contains 80 percent of its original oxygen; and, of course, the turbine shaft power would be available.

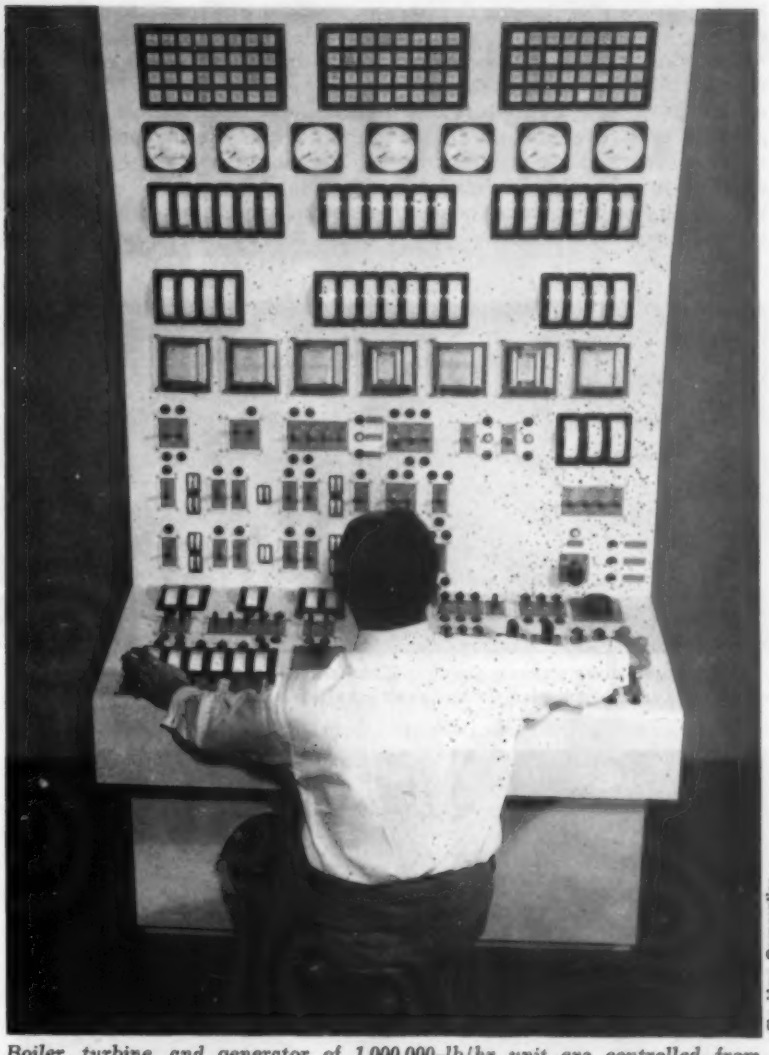
Another application of the gas turbine is that of supercharging steam boilers. The combustion system of the gas turbine is removed, and the air leaving the compressor is directly introduced into the boiler where all plant fuels are burned. After generating steam in the boiler, the hot pressurized gas is discharged to the gas turbine. It drives the turbine, giving power to compress the air. Residual power drives a generator.

Package boilers

Industrial powerhouses are continuing to reap the benefits of the pioneering work done in behalf of their utility-size big brothers. Development of standardized designs continues to reflect widespread acceptance of package units. Particularly significant progress is being made in coal-fired units.

A 12,500 lb/hr package watertube boiler designed primarily for coal firing, but equipped to burn oil and gas, will be installed soon. This boiler is the prototype of an industry-standard design for the 10,000 to 25000 lb/hr range, developed by Superior Combustion for the U.S. Navy under a program that enjoyed contributions of design from most of the country's leading boiler manufacturers. High refractory base usually required for small oil or gas steam generators converted to coal firing is eliminated. The base is only 15 inches high, and the boiler chill line extends to grate level. Conversion from one fuel to another requires but 60 hours. Refractory or costable baffles are replaced by chrome alloy steel.

Industrials like the idea of ordering steam generators "off the shelf." To increase capacity while staying within the physical limitations imposed principally by shipping clearances, package boiler manufacturers are showing increasing ingenuity. Designs are aimed at increasing mass rate of flow and providing more efficient heat transfer, thus increasing steam output per unit of volume occupied by the boiler.



The Hays Corporation

Boiler, turbine, and generator of 1,000,000-lb/hr unit are controlled from four-foot benchboard. Remote control and manual adjustments are on board.

Demand for bigger packages in shop-assembled steam generators is being met — in the larger watertube units—by dividing the total "package" into as many as three units ready for on-the-site hookup. As "package" sizes increase, more attention is being given to combustion control. Increasing interest is being shown in "metering" types that, though initially cost more, offer better combustion efficiency over a wide range of steam demands. Some oil-fired package boilers offer a firing range, or turndown, on a single burner of 12 to 1 with unusually high combustion efficiency at the reduced firing rates.

Caution is being advised on two specific factors regarding package boilers. First, capacity claims must be examined to be sure that present and future steam demands in the plant can be met. Capacity ratings of "package" boilers tend to be less conservative then the ratings of "conventional" boilers. Second, safety requirements must be emphasized in the face of the tendency to consider package boilers as being somewhat "automatic." Flame failure and boiler water

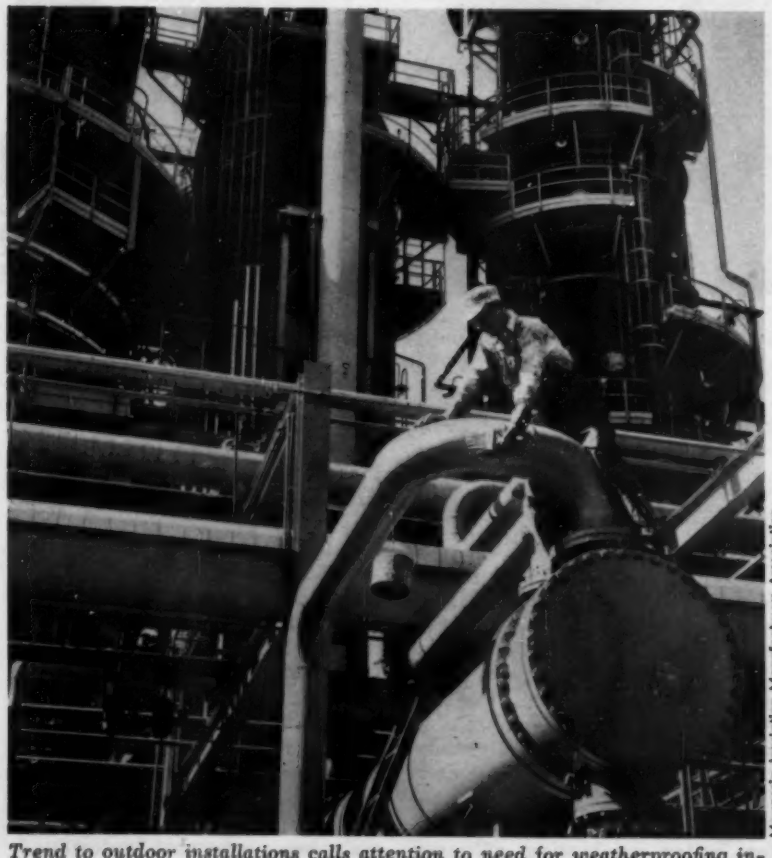
level must be given particular attention.

There is a growing tendency toward the "package powerhouse", using "turnkey" contracts for powerhouse construction. Under turnkey contracts, a contractor-engineer firm handles all details of engineering and erection, turning over to the owner a completed plant in ready-to-run condition. One of the automobile Big Three has used the turnkey arrangement for eight powerhouses — one each in New Jersey, Michigan, and Illinois, four in Ohio, and one in Tennessee. In one of these powerhouses, the conventional basement is eliminated, resulting in a basementless powerhouse that has boiler, fans, pumps, and control panels all on one operating level — the ground floor. Operation and maintenance are thereby greatly simplified.

Another construction trend is the movement northward of acceptance for open-air powerhouses. This design, first popular in the Southwest for natural-gas- or oil-fired stations, has moved up as far north, for example, as Martins Creek, Pennsylvania. The coal-fired unit there is rated 1,200,000 lb/hr. Steam generator, precipitator, stand pipes, water treatment, water intake, coal bunkers, and ash handling are all installed outdoors.

Childers Manufacturing Company

Aluminum jacketing protects piping in Kentucky chemical plant. Tee-joints and elbows are weatherproofed with asphalt emulsion wrapped with poultry wire.



Magnesia Insulation Manufacturers Association

Trend to outdoor installations calls attention to need for weatherproofing insulation. Initial application and followup maintenance are quite important.

Operating techniques

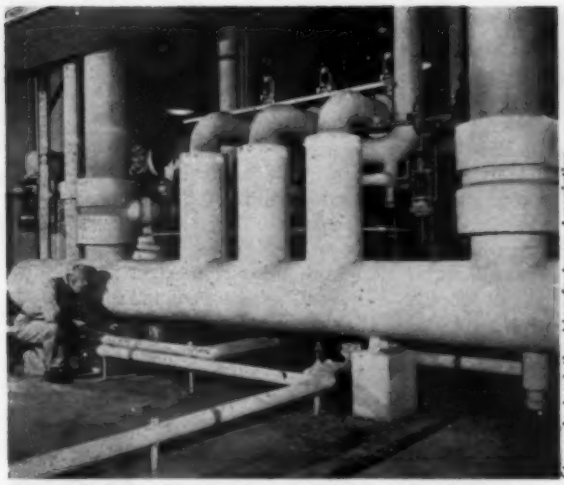
Two notable reports on operating techniques came out in 1955. One concerned rapid starting of pulverized-coal-boilers in the 150,000-lb/hr range. Units were put on the line within 90 minutes from a cold start, and within 60 minutes if restarted within 50 hours after the last shutdown. The technique involves assuring adequate circulation to prevent serious temperature differentials.

The second report concerns integrated steam station control. With the trend of increasing capacity per station paralleling the trend toward fewer operating people per station, the necessity becomes urgent for integrated control from fuel dock to bus bar. Look for increased activity in the realm of interlocks in control systems for starting, running, and stopping.

Piping and traps

Super alloys are being developed for the supercritical boilers with great benefit to subcritical units resulting. Some piping alloy tests have been carried on at pressures up to 30,000 psi. Thermal expansion, high-temperature stability, resistance to attack by supercritical water and steam, and ductility are among the factors under study.

Traps, strainers, and separators seldom cost more than five percent of the typical process steam installation, and often cost less than one percent. The tendency to overlook these items because of their seemingly small importance is disappearing as cost-conscious power services engineers realize that quality in these specialties give better steam. High quality



Magnesia Insulation Manufacturers Association

Improved adhesives make possible use of pasted jackets in place of more expensive sewed types for indoor use.

Allis-Chalmers Manufacturing Company

This 4000-kw noncondensing turbogenerator produces power at 2400/4160 volts from 100,000 lb/hr of steam.

trapping results in more uniform steam temperature, less maintenance, and less downtime. Group traps are being replaced by individual trapping. Traps are already available for 20,000-psi service in anticipation of the trends to higher steam pressures in industry.

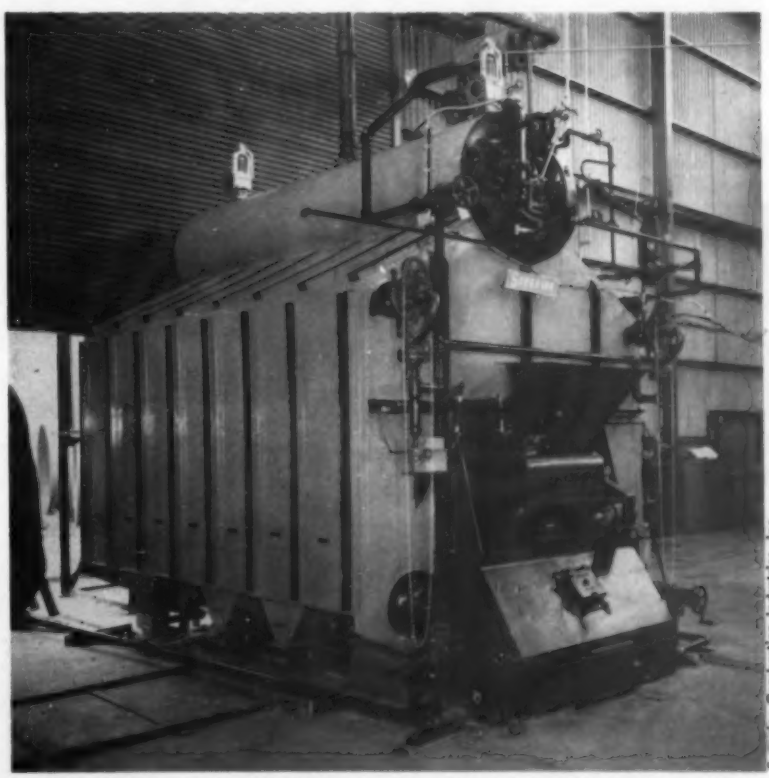
Thermal insulations

Among materials receiving much attention are the insulations used to hold heat within steam equipment. Blanket types, used when frequent removal and replacement is required as on the flanges of steam turbine casings, are the subject of continuing research. Better refractory fiber blankets are being developed that fully support themselves and that have high degrees of stability and mechanical strength at the increasingly high temperatures being found today in power generation and production processes.

Molded pipe and block insulations are being selected with greater attention to high efficiency and stability, ease of application, and low maintenance. Insulations with these qualities are available from the pace-setting manufacturers. Long life is a particularly important feature being stressed since labor costs for replacement are high.

Special insulation problems result from the trend to dual heating-and-cooling systems. Here, heat and condensation problems must be licked by a single insulation. The trend to outdoor installations of power and process equipment poses still another insulation problem — weatherproofing. Metallic, spray-on, and plastic outer coverings are proving successful.

Growing acceptance of high-temperature water as a heating medium is altering the proportions of the domain occupied by steam. Hundreds of successful foreign installations have inspired use of high-temperature water in this country — chiefly in military installations where many buildings



Superior Combustion Industries, Inc.

Package boiler, rated 12,500 lb/hr, is designed primarily for coal but can be quickly switched over to oil or gas. It is prototype for sizes to 2500 lb/hr.

spread over a wide area are heated from a central plant. Much interest is being shown by industrial firms in high-temperature water for space or process heating.

Economy with performance equivalent to steam is the great attraction of high-temperature water systems. Boilers are available in capacities up to 200 million Btu/hr. Design pressures go up to 500 psig, and temperatures reach 475 F. Oil, gas, or spreader-stoker firing is available.

Among specific advantages cited for high-temperature water are these: heat storage capacity of the system is large and losses are low, so that a smaller boiler is adequate to meet sudden loads; the completely closed system reduces makeup and reduces water treatment needed; the system completely eliminates the major maintenance work necessary with condensate pumps, traps, valves, and corrosion in comparable steam systems; and smaller size components are required for the entire system. Many subsidiary benefits accrue from the foregoing — making high-temperature water a promising medium for the future.

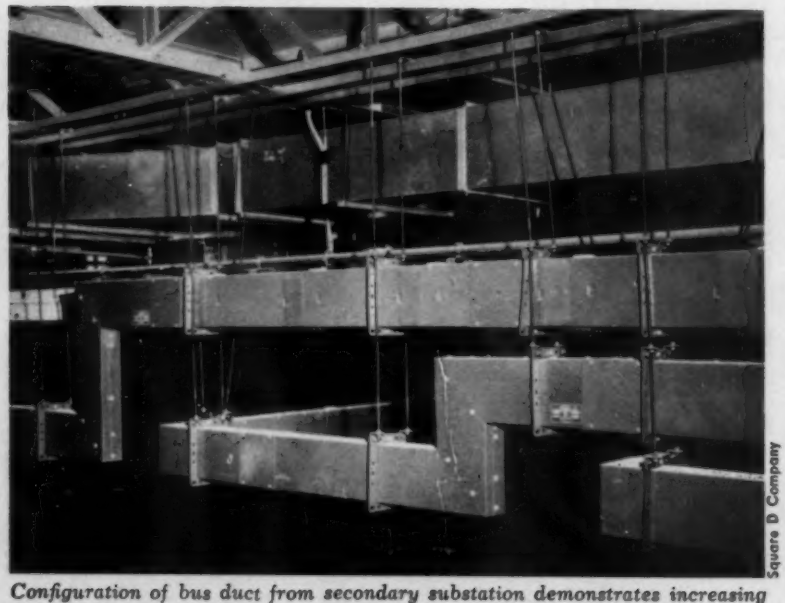
Turbine progress

Sizes up to 500 mw have been considered already by turbine designers. Aside of size consideration, turbine design progress has had the marked effect of increasing fuel economy to a considerable extent. Progress in utilization of available thermal energy is attributed to several new design features within the turbine itself. "Laminar flow" bucket shapes permit smooth flow of steam all along the bucket surface, producing increased stage efficiency. These shapes have been used in many high-pressure stages recently. "Laminar vortex" bucket shapes, combining laminar flow with vortex design, have been used to advantage in intermediate stages.

ANNUAL REVIEW AND FORECAST

Electricity

Increasing loads in industrial plants underscore importance of electricity.



Square D Company

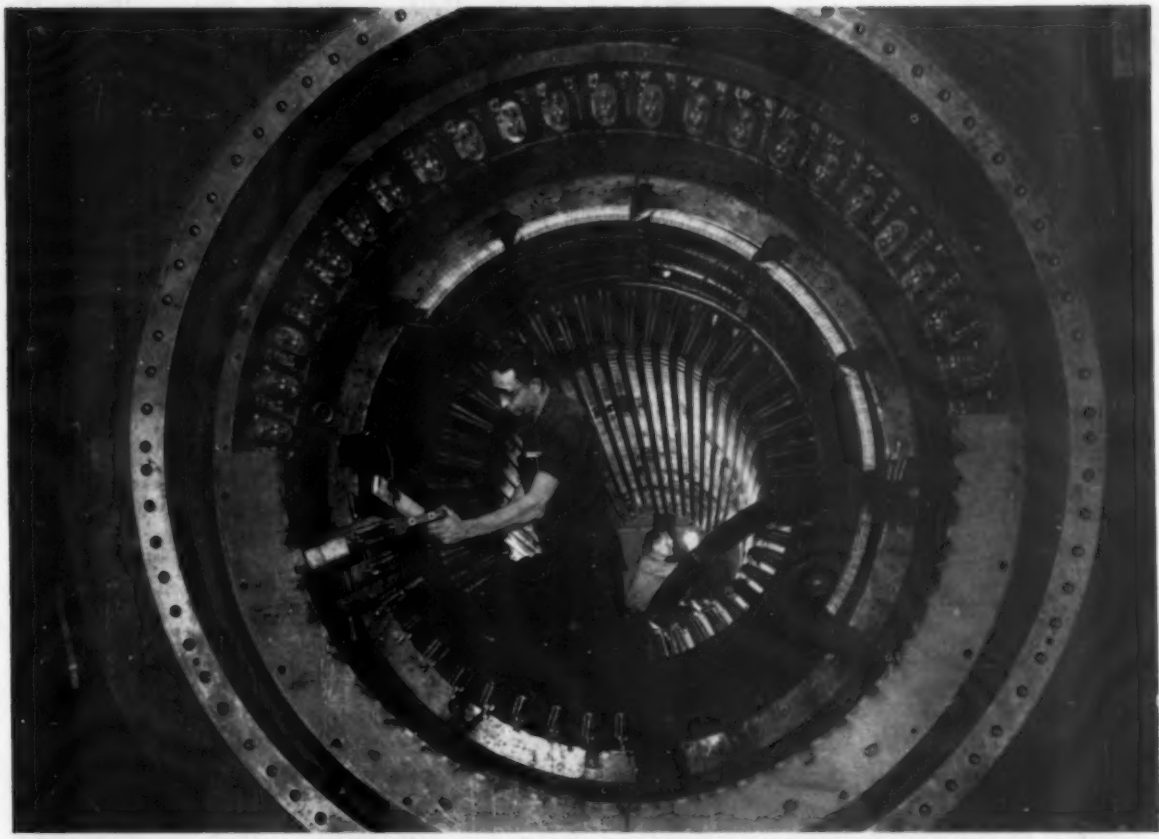
Configuration of bus duct from secondary substation demonstrates increasing importance of adequate current capacity, flexibility, and salvageability.

THAT ELECTRICITY is becoming increasingly important to industry is perhaps obvious. Not always so obvious, though, is the extent to which this dependency on electricity has grown. A most graphic set of statistics makes the point thus: electricity used per industrial worker was 8600 kwh per year in 1939; usage *per worker* per year was about 18,000 kwh in 1954. Latest Federal Power Commission figures show that 1955 production of electric energy by industrial power plants increased 9.1 percent over 1954. Sales by utilities to industrial customers increased 26.7 percent over the same period.

In the next 10 years, it is expected that our gross national product will increase some 40 percent. However, the work force will be able to increase but 13 percent. Industry will be forced to provide more electric power per worker than it has ever furnished before.

The great dependency of industry on electricity is forcing fresh considerations in industrial plant system design. Economic studies are being used to investigate the relation of system costs to the following factors: initial cost as affected by present provisions for deferred, but inevitable, load growth; reliability befitting the processes being served; flexibility to accommodate load shifts from area to area; and purchasing power versus generating in the plant.

Underlying all of these economic



First large generator with liquid-cooled stator windings is nearing completion. It is rated 260,000 kva at 3600 rpm. New, more efficient cooling method permits significant increase in generator capability without increasing physical size.

considerations is the fact that power is an increasingly larger part of the unit cost of producing industry's output. Where power costs were formerly considered overhead, automation-conscious industry is developing a degree of dependence on power that requires that power costs be included in direct computations of unit manufactured product cost.

System adequacy in terms of voltage regulation, frequency stability, current-carrying capacity, interrupting duty, surge protection, and duty cycling are all becoming extremely important because individual faults may cause shutdown of vast expanses of a production facility.

Switchgear

A topic receiving much attention in switchgear is interrupting capacity. Industrial systems have grown larger and larger, requiring that users recognize the dangers of inadequate interrupting capacity. Manufacturers, also recognizing this problem, have concentrated their development efforts on higher interrupting-capacity breakers.

Industry standards now list a complete set of 240- and 480-volt ratings for breakers previously rated at only 600 volts—so that interrupting ratings have increased on given equipment in recognition of the voltage actually applied. This results in more realistic use of switchgear ability. The fact is that 90 percent of the switchgear in industrial plants is operated at 480 volts or below, making the nominal 600-volt ratings excessive in terms of actual practice. Savings of 27 percent, for example, are possible using the new 480-volt ratings in place of the 600-volt ratings on a 1000-kva load center under the same conditions.

Reinforcing the almost-universal trend toward use of the unit substation is the development of a unit concept in switchboard design. Basic system elements are pre-engineered, with the circuit, metering, control elements, and instruments shown on standard specification sheets. Basic circuits available include ac feeder with overcurrent protection, tie-line with pilot wire differential protection, large ac generator, and synchronizing equipment.

Transformers

Aluminum windings for transformers, especially dry-types, look to be a sure thing sooner or later. Economics of manufacture are holding up widespread use of aluminum windings. However, aluminum wire processing costs and the extra costs involved in assembling an aluminum-wound transformer are expected to be reduced. A consolidated report on experiences with 100 such transformers shows that all technical problems have been solved. As soon as the relative prices of copper and aluminum make the aluminum-wound transformer attrac-

tive, expect to see more of them. Just when this economic break-even point will be reached is a matter of debate among the experts at this time.

Several manufacturers report increasing popularity of the sealed dry-type transformer. The dry-type is preferred over the askarel-filled for indoor applications, chiefly because it contains no liquid to check or to replace. Both the dry-type and askarel-filled are preferred over the oil-filled transformer. The dry-type and askarel-filled require no special vault for indoor installation.

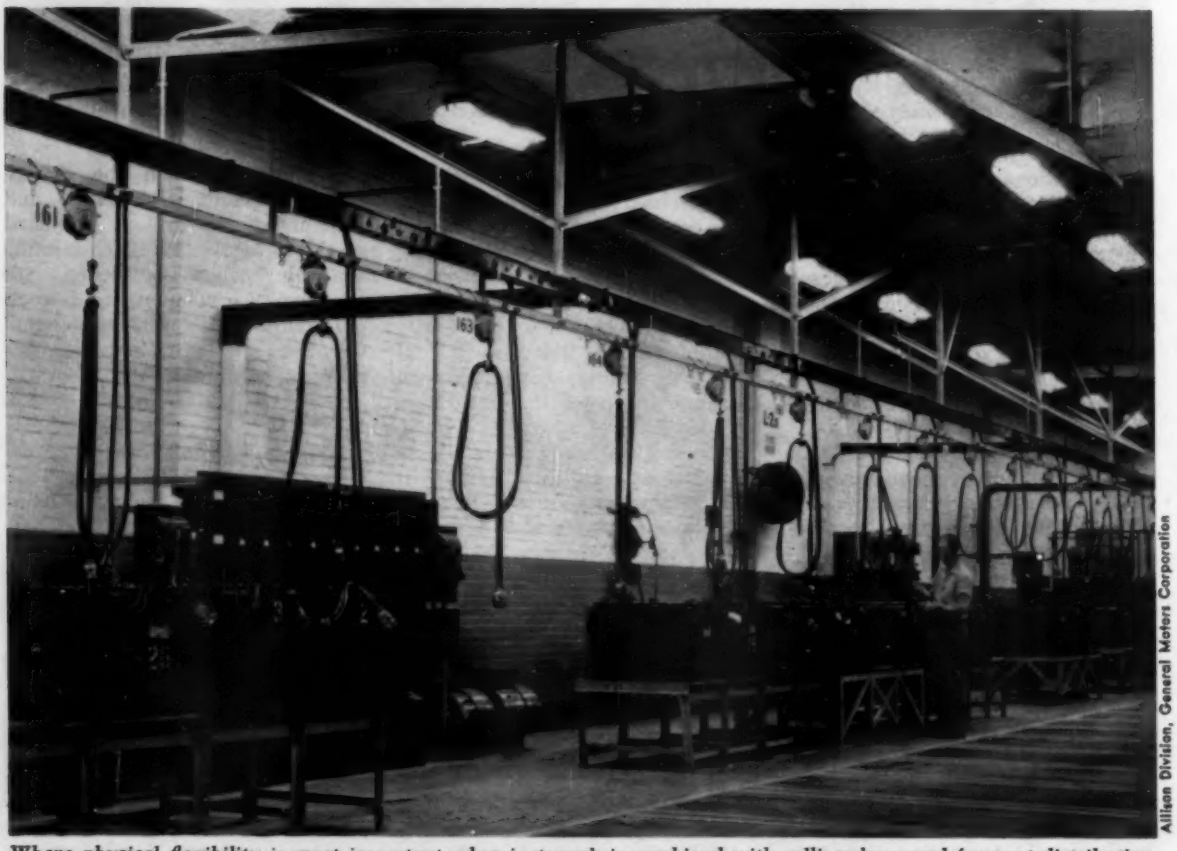
Objections raised against dry-types because of their low impulse levels are being answered by inclusion of suitable surge protection where needed or by placing them in nonexposed areas. Dry-types are ordinarily noisier than liquid-filled transformers. However, at least one manufacturer claims to have units which meet the standard levels established for liquid-filled transformers. Units quieter than this standard are available, also.

Use of larger transformer sizes tends to increase as loads increase. This is true for two reasons, in particular. Load growth in industry is occurring more because of increased load per square foot of existing plant area than because of new plant area being created. Thus, the alternative to larger transformers is more of them in a given plant area—requiring that more plant volume be occupied by "nonproductive" substations. But transformer reliability is so high with respect to associated system equipment that engineers feel secure in putting more load through an individual substation transformer.

Insulations

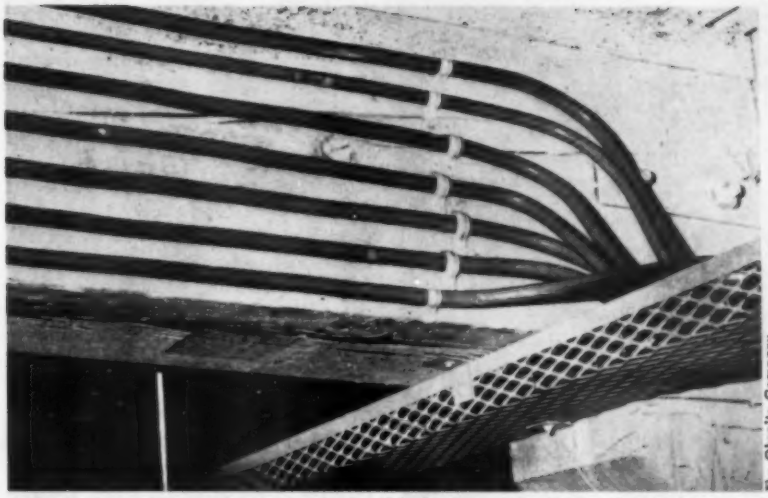
Insulations are receiving much attention, since they are the principal limiting factors in electrical capacity. Utilization voltages are constantly climbing. Within the confines of an industrial building, the trend to high voltage generally reaches its limit in the primary system, around 15 kv. The trend to high voltage in industrial plants, then, is manifest under this limit—but with more plants going to the higher in-plant distribution voltages as a company standard. One of the automobile Big Three, for example, has standardized on 13.8-kv systems because study after study has shown this to be the economical voltage in almost all cases. Insulations for industrial conductor must operate at these higher voltages, yet stand up under the adverse conditions imposed by the more corrosive contaminants and higher ambient temperatures typical of today's industrial environments.

Perhaps the greatest milestone in insulation progress is the predicted adoption of functional standards for establishing insulation classifications, in place of the present chemical-composition sys-



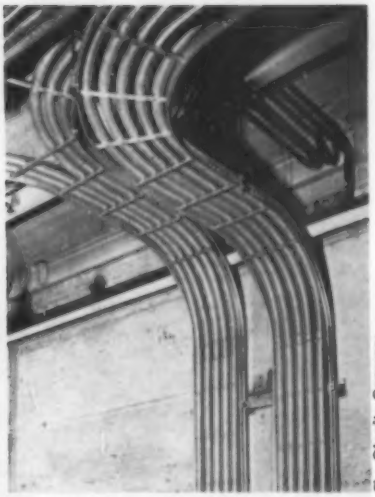
Allison Division, General Motors Corporation

Where physical flexibility is most important, plug-in trough is combined with rolling drop cord for neat distribution.



The Okonite Company

Introduction of aluminum-sheathed cable brings with it new high in ease of installation. Flexibility of aluminum sheath permits neat and easy twists.



The Okonite Company

These 2300-volt feeders show neatness and compactness of armored cable.

tem. Thus, the many varieties of insulations being developed can be grouped in terms of actual function, such as voltage level and thermal stability—terms most meaningful to those who must use the insulations.

Conductor

Conductor material is still a focal point of the aluminum-versus-copper conflict. There is sufficient copper to meet all needs, but not sufficient quantities of low-price copper to meet the competition from aluminum on all fronts. Indicative of aluminum's growing importance is the fact that proposals have been made to include current-carrying-capacity tables for insulated aluminum conductor in the 1956 National Electrical Code, doing away with the need for conversions from the traditional copper standards.

Aluminum also is moving in as external sheathing and armoring. Aluminum-sheathed cable is already available for control and for power circuits. In cases where the aluminum is subject to corrosive attack, polyvinyl chloride or neoprene outer coverings are offered as an integral part of the factory fabricated cable.

Tests are reported on butyl-rubber-insulated cables operating up to 15 kv. They show butyl rubber excels conventional compounds at normal and emergency load levels in resistance to physical aging. Though butyl rubber was first used successfully in 1945, it is only now enjoying increasing recognition as an electrical insulation.

The persisting trend toward higher operating temperatures underscores the importance of the silicone family of insulations for industrial conductor. Operating temperatures up to 200 C are permissible with silicone-rubber insulated cables—with the additional virtues of excellent moisture resistance, flexibility equivalent to rubber, high tensile strength, good ozone resistance, and easy terminating techniques.

Plastics—such as polyvinyl chloride and polyethylene—offer advantages of economy, stability, and versatility. Major producers of these types of conductor nonetheless advise caution. They point out that as good as the plastics may seem, they cannot be safely considered all things to all men.

Some stability in application practices is showing up in conductor forms. Some wire and cable people, for example, privately acknowledge that there is a place for plug-in and feeder bus duct, as well as for their products. Plug-in and feeder bus duct are quite popular for indoor secondary wiring, principally because of their operating flexibility and their salvageability. Where more protection is needed, conduit systems still are used in place of bus duct. Tapoffs from plug-in duct are made with either conduit or flexible cord drops.

Self-supporting aerial cable is increasingly popular for between-buildings wiring because of its better regulation and safety. Flexible-armored cable is still popular for inside primary and secondary (480- and 600-volt) wiring.

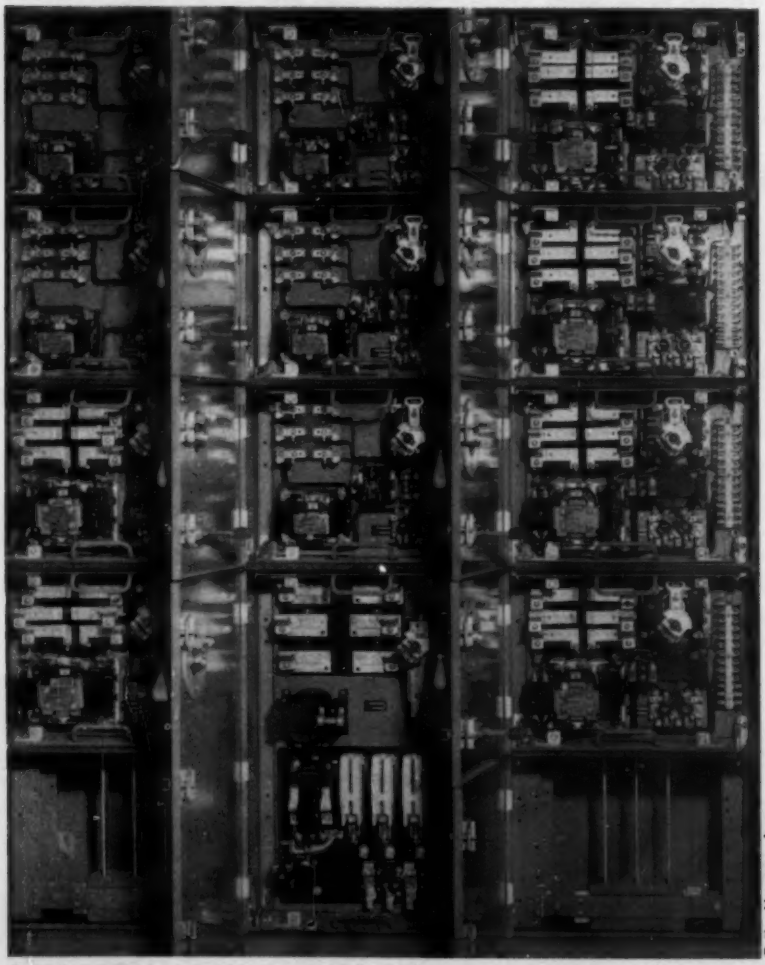
Motors

Comeback of the dc motor is perhaps the most significant trend now in motion. Demand for more dc motors reflects increasing demand for the accurately controllable adjustable speed drives necessary in automated production. Government figures show that purchases of dc motors in the 1-hp to 200-hp range are up 85 percent in the last 10 years. Purchases of all motors in that range are up only 20 percent.

Within the trend to dc motors, some see greater preferences for Class B (125 C) motors in the 1- to 100-hp sizes. There is some doubt that Class H motors (180 C) in these sizes will be used to any great extent in the near future.

To operate the dc motor in today's predominantly ac plants, there has been a boom in packaged conversion equipment for installation near the dc motor itself. Progress in rectification is following the general trend toward exploitation of high-temperature operating conditions. Selenium rectifiers, for example, are de-

Lighting of turbine rooms deserves as much thought as lighting of any production area. Here is fine example of even, glareless powerhouse lighting.



Cutler-Hammer, Inc.

Trend to motor control centers has brought compact, interchangeable components. Notice vertical busses in bottom cubicles, handles, convenient terminals.

scribed for operation at 125 C and 150 C with substantial life expectancy—though certainly not full life expectancy when operated at full-load at high temperatures. Rectifiers in units of 100 kw and more are being used increasingly. Many such installations are at least five years old already. (Apart from motor drives, considerable demand for dc has developed from rapidly growing electrolytic process industries. The mechanical rectifier is meeting with increasing acceptance for supplying such needs.)

The motor market shows almost complete availability from most manufacturers of the rerated ac motors in all affected sizes. Design changes are still promised by manufacturers, though.

An all-silicone-rubber-insulated motor has been introduced in the several-hundred-horsepower range. It is offered as a Class H insulation, and is offered for Class B applications in some instances. There is no extra charge for the silicone-rubber insulation systems for these motors. It is expected that this insulation system will be extended to sizes as small as 50 hp.

Most important aspect of silicone rubber for motor insulation is that silicone rubber is so resistant to industrial contaminants that the motors can be installed with less enclosure. There is little need for expensive types of motor enclosures when motor windings themselves are impervious to anything the motor enclosure itself might be designed to keep out.

Silicone rubber is not competitive with Class A insulations, with Class B insulations for most applications, nor with other Class H insulations in the smaller integral horsepower motors. Many of the newer Class A insulations are offering advantages such as lower cost, greater reliability, increased thermal stability, and long life.
thermal stability, and long life.
Competition among motor manufacturers for sales in power services field will be based to a large extent on considerations of insulations during the forseeable future.

In some cases, inert-gas-filled motors are being used to meet explosionproof requirements at large horsepower ratings. The ad-

General Electric Company

Though lighting level (above) was only 10 fc before relighting, intense brightness of globes was distracting.

General Electric Company

But new system (above) provides 60 fc and has no glare. Painting helps, too. Lighting system is rented, a new trend.

vantage is primarily in cost. One manufacturer, for example, shows the inert-gas-filled motor to be cheaper than explosionproof motors for all speeds at horsepower ratings over 1250 hp.

Motor control

Control centers predominate in motor control. Plant after plant can be cited where the building-block concept of control centers has permitted economical, labor-saving, and quick alterations to meet the demands of production changes. Control center components themselves are being made more compact and easier to rearrange through use of inside tie busses. There is increasing dependence on interlocks as automation concepts take firmer root in industry. Inter-relating of sequential and concurrent operations demands more sophistication in motor control—making the control center even more attractive.

An important aspect of the motor control picture is reliability. Two means of attaining it are becoming quite basic. The first is preventive. It uses the idea of constantly scanning the control system to spot trouble in advance. Sequential scanning equipment is now available to monitor control circuits and to check itself as well.

The second approach is remedial. Manufacturers are offering components in plug-in mountings to permit quick replacement of faulty equipment.

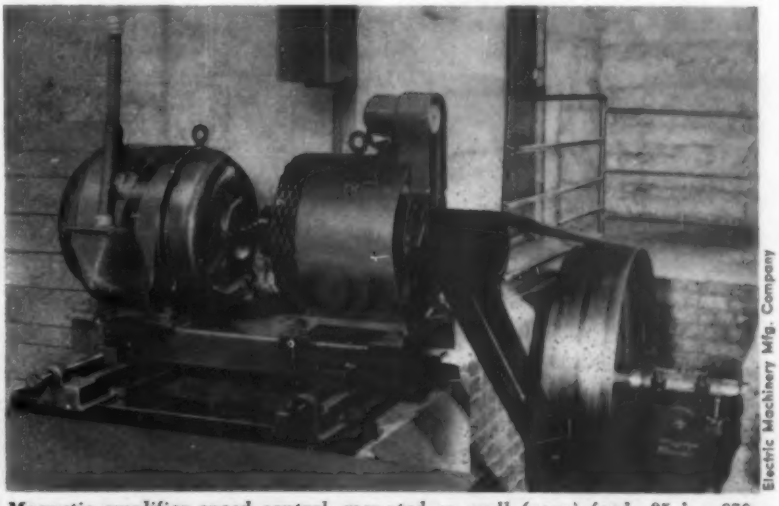
Control components are being packaged. Some are offered in hermetically sealed units. Inherent vulnerabilities of moving contacts are being eliminated by substitution of solid-state semiconducting and magnetic devices.

In the face of all the sophistication offered by motor control manufacturers in equipment design, there is apparently still need for more sophistication by users in application. Interrupting capacities are often inadequate, and loss of life is too often recorded on account of that. Too little attention is given by users to relay settings, delay times in relation to motor thermal capacity, and detail studies of application requirements as related to motor and control.

Lighting

Industrial lighting is progressing on three fronts. The first is the continuing development of improved light sources. Color consciousness is most important here. Fluorescents and mercury-vapor lamps, especially, are being introduced with improved color balance.

Second, industrial lighting practice shows no ceiling on maximum intensity levels. Some plants are using general levels of 200 ft-c for inspection areas. The range of 50 to 100 ft-c is becoming quite



Electric Machinery Mfg. Company

Magnetic amplifier speed control, mounted on wall (rear) feeds 25-hp, 870-rpm ventilating fan—typical of increasing attention to speed control.

Sorgel Electric Company

Because floor space in industry is critical and must "earn its way," continuing trend exists to use "volume" within plants wherever possible. Here substations are placed above their loads, up in the clear space over the traveling crane.

common, even in high-bay assembly areas.

Along with intensity comes the concept of brightness ratio. This is the third front on which lighting progress *can* be achieved. Admittedly, very few engineers in industry are even aware of brightness ratio—much less its importance to effective illumination. But brightness ratio—the ratio between the intensity of task area illumination and the intensity of the immediately surrounding area — is perhaps more important to worker efficiency than is intensity itself. And the true measure of lighting effectiveness is ultimately worker efficiency.

Allis-Chalmers Manufacturing Company

New low-voltage breaker offers dead front panel and bridge-type contacts.

The principal method of reducing brightness ratio in fluorescent systems is to slot the fixture reflectors so that some light is thrown upward. As much as 40 percent may be diverted upward, reducing harsh contrasts between the areas above and below the fixture.

Slotting of fixtures has another beneficial effect aside from reducing brightness ratio. Ventilation resulting from slotting prevents deposits of smudge on lamps and reflectors. This benefit of ventilating reflectors is often underestimated until actually observed.

Making further progress in industrial lighting is the concept of group replacement. Systematic relamping undoubtedly is cheaper than random relamping. The only question that remains is the interval for group relamping. There is no pat answer since there are too many variables. Characteristics of the lamp types are of primary importance. But the individual installation configuration, local labor costs, and so forth all enter into the computation of the optimum period for relamping. But that optimum period is easily computed.

Communications

In-plant and intra-company communication is gaining more recognition as a vital power service because of the increased pace of plant activity and the extended areas encompassed by company operations. Instant communication via private telephone is increasingly important. Over 90 percent of oral communications within industrial plants are via the telephone. And 70 percent of telephone

traffic is within the organization. Management finds control over company operations improves because of the efficiency of private telephone systems. Handling of outside calls becomes more efficient when the load of interior calls is removed from the regular outside service facilities. Thus, the case for in-plant private systems becomes stronger as time goes by.

With anticipated favorable action from the Federal Communications Commission, increased use of short-distance, in-plant radio is predicted. Private radio paging systems being tested use receivers carried by plant executives.

Electronic data-processing is predicted to be the next big step in development of industrial communications. One firm reports that extensive study shows ultimate need for complete two-way interconnection between every transaction point throughout the company. The firm's complete plan calls for two comprehensive sets of equipment: a complete, private-line fully automatic set of teletypewriters, and electronic storage and computing equipment for all data-processing.

ANNUAL REVIEW AND FORECAST

Gases

Air conditioning leads the way to more effective use of fundamental gas—air—in industry.

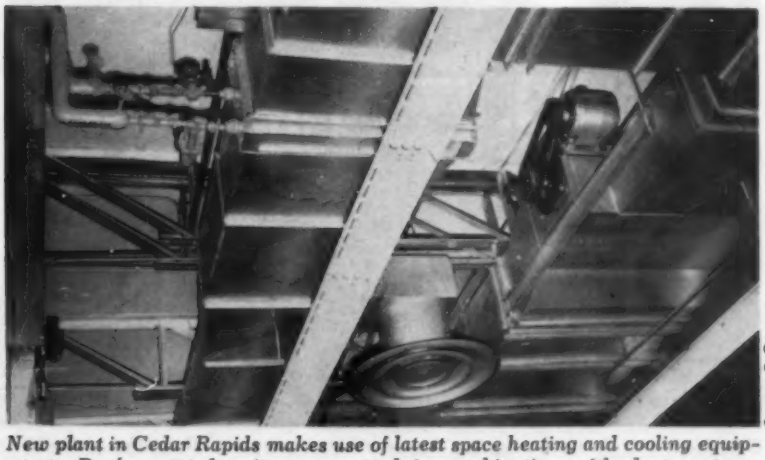
AIR—MOST IMPORTANT of the gases handled within the realm of Industry's Power Services—is making sensational progress in establishing its importance through the everwidening use of air conditioning in industry. No longer is air conditioning considered a novelty. Nor is it merely considered from the employee-comfort viewpoint. Air conditioning is moving out into the plant, coming to be an essential-to-production power service in the mind of industry. Year-round temperature and humidity control will ultimately become standard equipment for all areas of industrial plants.

Along with industry's increasing demand for air conditioning, there is increasing shrewdness in specifying the equipment. Power services engineers are asking for low initial, operating, and maintenance costs. They are asking that installation of air conditioning be done without interrupting normal plant production.

Built-up systems will be used in substantial numbers for industrial air conditioning, though package units will be used in some plants. Generally, built-up systems have longer operating life, presenting a favorable long-term cost picture even though the initial installed cost of a package unit may be less. Built-up central systems comprise fewer units, reducing service time and travel time of maintenance personnel between equipment locations in the plant.

Central built-up units are more amenable to separate control of temperature and humidity. They are also more amenable to handling isolated heavy heat loads from hot production equipment. Another advantage is that power need be routed to fewer locations for central units. Plant heat balances may be improved in some cases where low-pressure waste steam or low-cost fuel is available to power an absorption refrigeration machine for the air conditioning system.

Increases in the use of package air conditioning are expected in industrial plants where there are no critical problems of temperature, humidity, air distribution, or process control. The package air conditioner offers advantages of preassembly in the manufacturer's shop. It often can be installed with no ductwork. Single- or multiple-unit installations are used to meet individual plant requirements. Manufacturers are supplying package units up to 30 tons in their efforts to match capacity to needs



Square D Company

New plant in Cedar Rapids makes use of latest space heating and cooling equipment. Roof-mounted units are spotted in combination with duct systems.

Airtemp Division, Chrysler Corporation

Printing plant installed package air conditioners around work area to provide comfort with maximum flexibility.

while maintaining the package concept.

Two power problems arise as use of air conditioning grows. One is that air conditioning loads electrical systems heavily. They must be reexamined to be sure that their power-delivering capabilities keep pace with the demands of air conditioning. This problem is particularly acute in large commercial buildings. Air conditioning units are being plugged into electrical systems that were adequate for the lighting loads they were designed to carry 20 or more years ago. Many large buildings have had to be rewired to carry today's air conditioning loads.

Second big problem arising from air conditioning, particularly with the large capacities found in industrial plants, is water supply. Many cities (New York, for example) have laws requiring water-saving devices in air conditioners. Waterless units are being designed in larger and larger sizes, but the largest completely waterless units available (from one leading manufacturer, at least) are 7½-ton models. Units using water evaporative condensers reduce water consumption to some 5 to 10 percent of that used in other systems. These units are available in package units up to 30 tons.

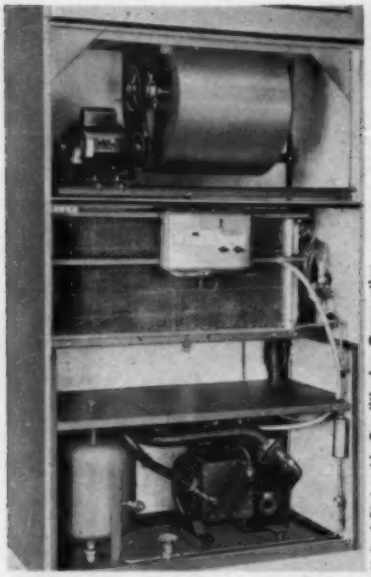
Many industrial processes require air conditioning as a prerequisite to production. Humidification, dehumidification, and temperature control become more important as process environments become more critical. Great value of capital investment, production labor, and material in process demands that plants must operate as closely as possible to the theoretical peak rate of production without endangering the plant, the workers, or the material in process. Vaccine production, for example, requires growth of virus. Growth is more rapid and production is highest at higher temperatures. Excessively high temperature, however, could kill all the virus. So temperature must be held close to the critical high, but not so close as to endanger the process. In many similar ways, air temperature and humidity become important to quantity and quality of production. It is management's cost consciousness that demands this utmost in productivity through air conditioning.

Compressed air

Compressed air is widely used to drive production tools, so compressed air supply remains important among Industry's Power Serv-

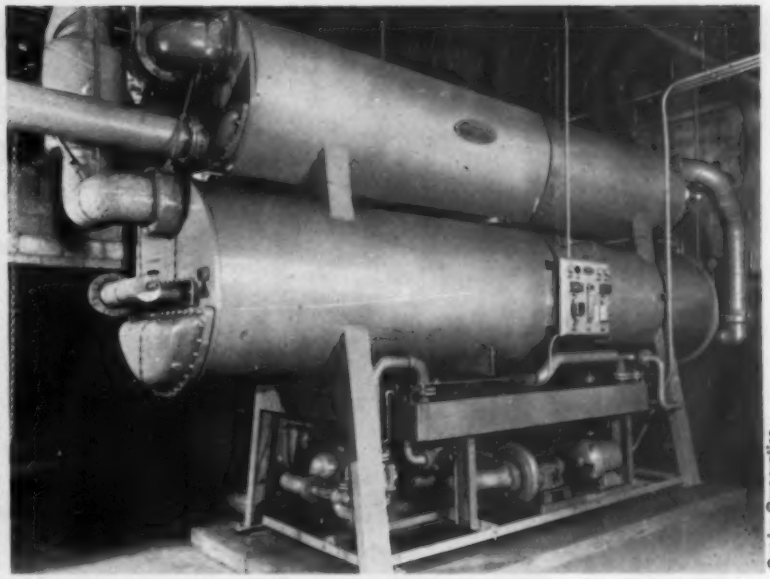
Dravo Corporation

Gas-fired unit heaters take up far less room in plant than the potbellied stoves and coalbins they replaced. Heating is uniform, efficient, automatic.



United States Air Conditioning Corporation

Internal view of package unit shows compact arrangement of components.



Carrier Corporation

Lightweight absorption refrigerating machine is rated 350 tons, representing line from 100 to 700 tons. Machine operates from steam or any hot liquid.

ices. The general interest in improving reliability throughout industry is forcing study of methods to plug loopholes in power services —and so great attention is being shown in clean compressed air. Aftercoolers, cyclone separators, and individual filters preceding pneumatic devices are being widely used (when the condition of the compressed air demands) to prolong equipment life, reduce maintenance, and decrease production costs.

Demand for compressed air as an energy-delivering medium in Industry's Power Services is increasing with the growth of industry's automation consciousness. Automation employs concepts of control and actuation. Virtually every control system has its compressed air components. Actuating systems also frequently use compressed air. Primary use of compressed air in atomic power occurs in the control system.

ANNUAL REVIEW AND FORECAST

Liquids

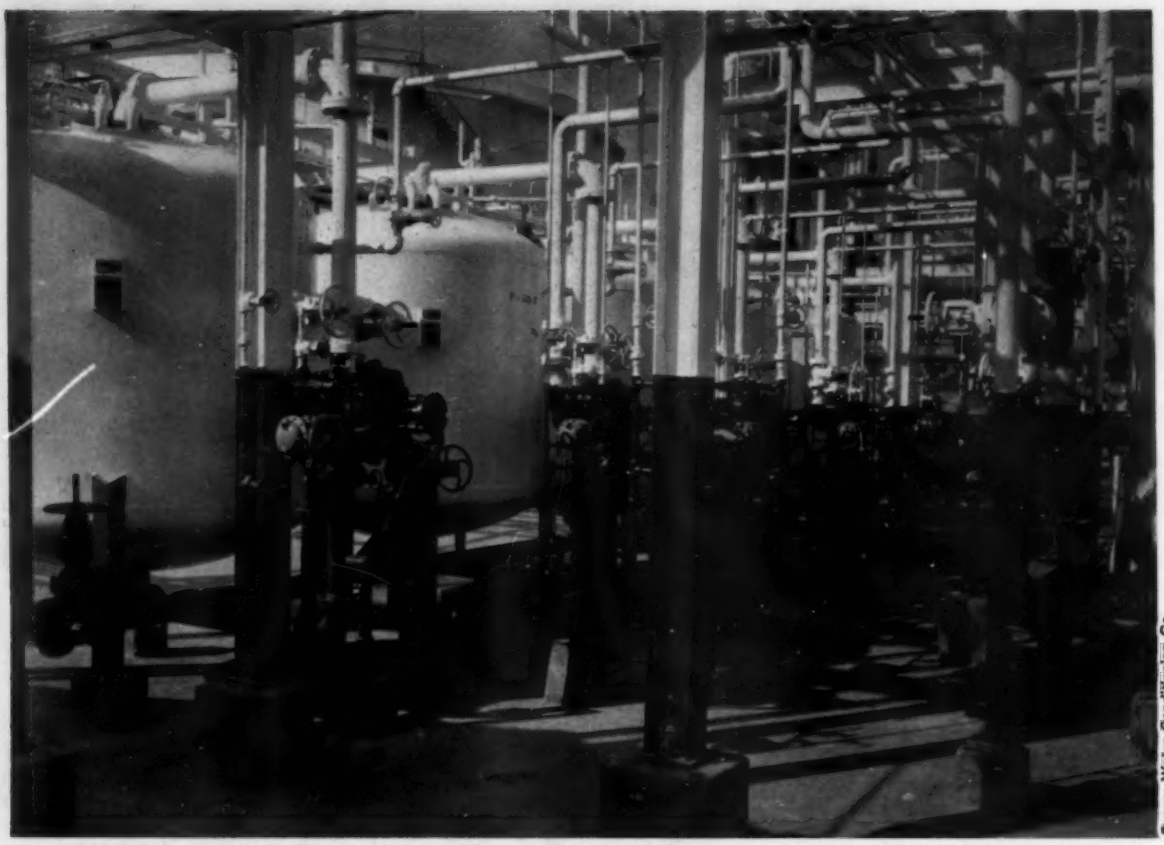
Water is dearer, making liquids a power service of increasing concern.

COMPETITION FOR industry's basic liquid — water — is increasing due to growing demand in the face of limited supply. The general effect on industry is to make conservation practices economically attractive. For this reason, there is increasing tendency to recover and reuse industrial water.

Raw water treatment becomes more important as the quality of incoming supplies tends to become poorer. Clarifiers, chemical feed units, demineralizers, extensive filtration, deaeration, and increased holdup capacity for treated raw water are becoming more commonplace in industry.

Use of waste recovery systems is booming. Several benefits accrue from waste recovery. Need for conserving expensive water by reusing it, however, is most often the initial reason for considering waste recovery systems. Once this need is established, the other equally important benefits are recognized. One of these is reduced stream pollution from discharged wastes. Another is that the value of the recovered waste often pays for the equipment needed for the water recovery and pollution abatement.

Ultraviolet radiation treatment of raw water can be expected to compete with chlorination. Highly efficient, long-life ultraviolet lamps have now been developed. An estimate by one manufacturer predicts that a 40-watt ultraviolet lamp can



Grover Water Conditioning Co.

Hot process softeners with filters and hot zeolite are being called upon more and more for boiler water treatment.

treat "average" water at the rate of 750 gallons per hour. Several factors influence the effectiveness of this ultraviolet treatment, including salts and organic content of the raw water and water temperature. Chief future for this technique is in plants that require pure water without chlorination.

Westinghouse Electric Corporation

First canned motor-pump ever used to drive boiler feedwater in closed loop.

Cooling towers

Cooling towers are being used both in new plant construction and for existing plants changing over from well water, river water, and other surface sources. Increasing demands of public health authorities, wild life commissions, sewage treatment operators, and stream pollution abatement agencies are combining to encourage the switch to cooling towers. They reduce plant cooling water requirements by about 95 percent in the average situation.

This greater dependence on cooling towers is forcing tower design toward higher capacities, greater reliability under increased loadings, development of better tower materials, and improvements to extend service life. Look for increased use of treated lumber and asbestos-cement materials plus continued improvement in mechanical components. Structural designs are being altered to permit lower silhouettes in keeping with modern industrial architecture.

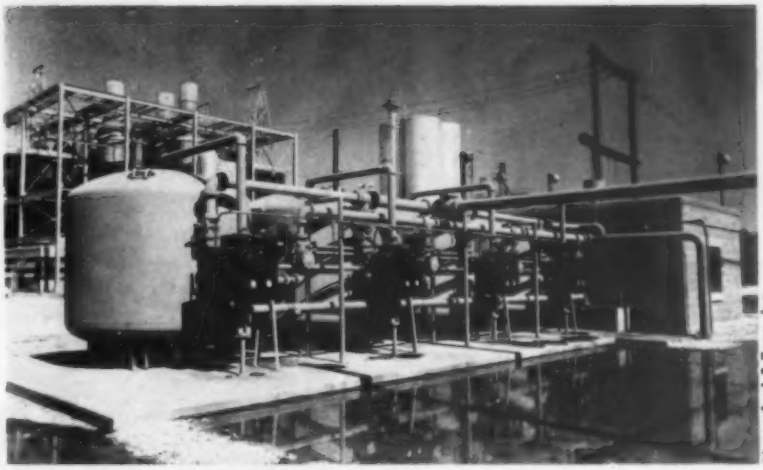
The trend to higher pressures in boilers has stimulated demand for water of higher purity, which in turn has resulted in demand for more demineralization and hot process, hot-zeolite systems. Mixed-bed demineralizers are becoming very popular in the power industry. Such equipment has the ability to deliver the very purest grades of water. One triplex mixed-bed system delivers water of 15 million ohms/cm resistivity, and reduces silca content (SiO_2) to 0.02 ppm. The trend in powerhouse water treatment work is seen by some, but not all by any means, to be away from hot process to the demineralization treatment.

Water treatment control

The overriding general trend toward making industrial life automatic is as prevalent in water treatment as it is elsewhere. Product improvement in water treat-

ment is mostly a matter of improving existing equipment. However, fresh ground is being broken in the control aspects of the installations. Automatic, centralized control of water treatment facilities for raw water or boiler water is demanded by customers. Along with this trend, there is growing demand for the automatic control to include the pre-treatment processes—such as chemical feed and filtration of the raw water—as well as the boiler makeup water treatment as such.

It is conservatively estimated that at least half of the water treatment plants now being built for the power industry are of automatic types. Specific advantages are savings in operating labor, accurate operation, and continued operation for longer periods of time.



Hungerford & Terry, Inc.

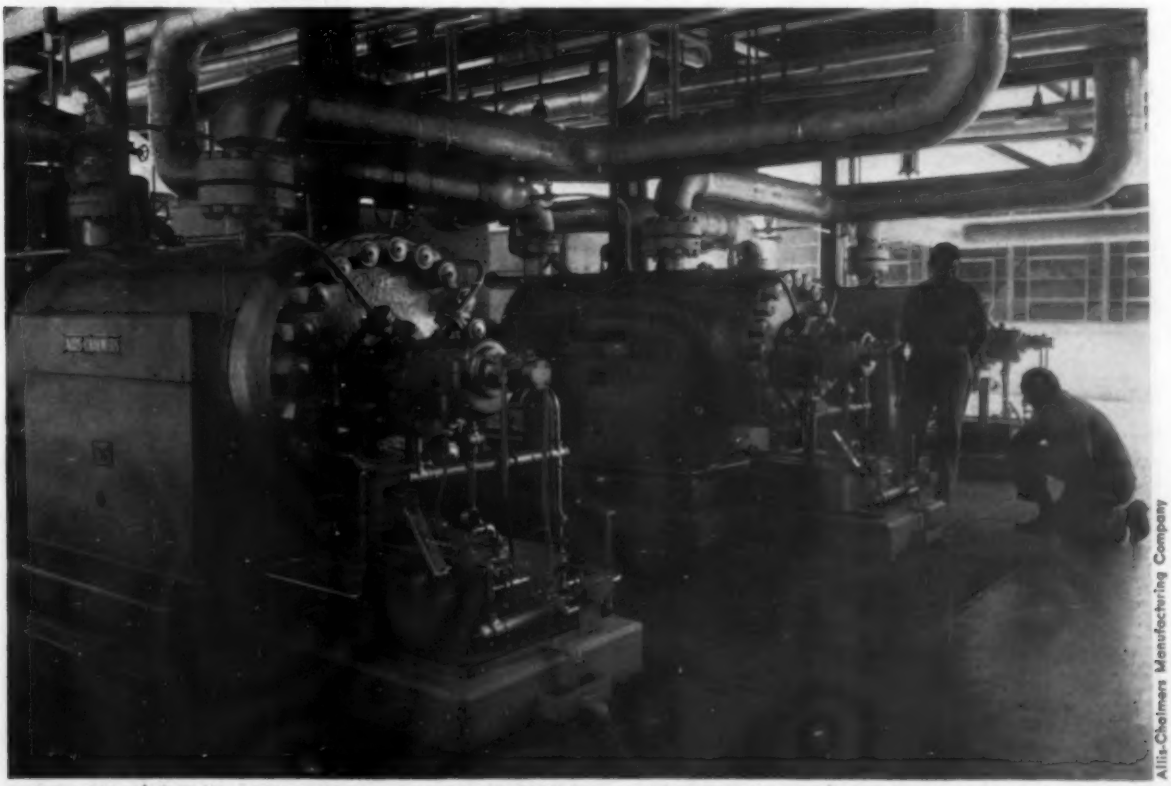
Typical of the fully automatic water treatment plants used by industry is this one for removal of ferrosand iron and manganese, rated 1000 gpm.

Pumps

Pump reliability is reaching such heights that many of the largest utilities are confidently placing all of their pumping eggs in one basket. One station is connecting a 12,000-hp boiler feed pump directly to the turbine shaft.

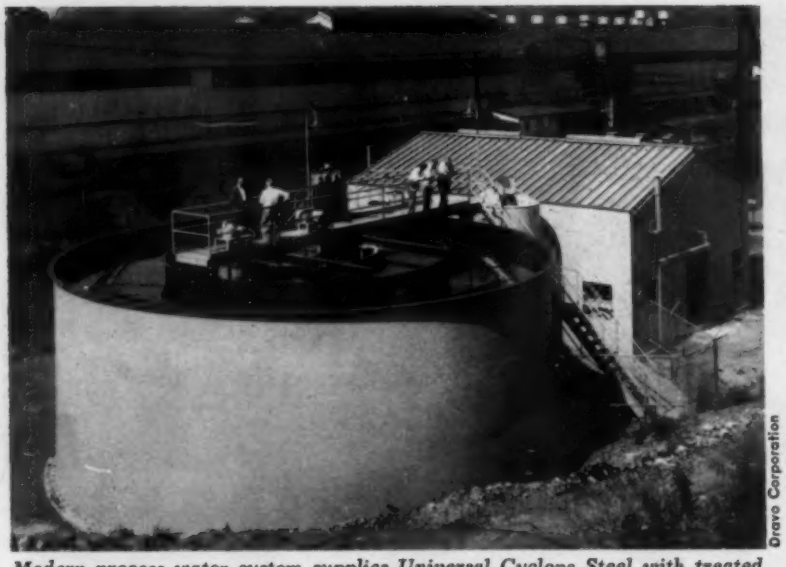
Significant increases in power station output with relatively small additional investment is predicted in use of new high-speed steam turbines to drive boiler feed pumps. Initial designs are planned for stations rated 100,000 kw and up, since it is the use of higher-rated, high-pressure reheat turbines that makes this kind of drive attractive.

The driving turbines tap steam from the cold reheat line and exhaust it to the feedwater heating



Allis-Chalmers Manufacturing Company

Pumps with packingless stuffing boxes are rated 525,000 lb/hr at 1820 psig, 350 F. Pumps are in modern outdoor station.



Dravo Corporation

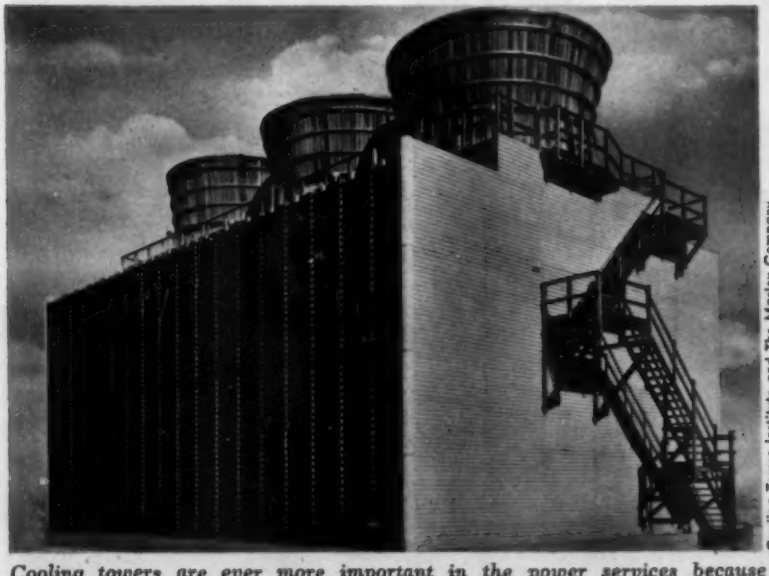
Modern process water system supplies Universal Cyclops Steel with treated, chlorinated water at 1500 gpm. New plant has capacity for future needs, too.

system for the main turbine. Highly efficient plant heat rates are obtained. Net electrical output rises some three or four percent—the amount that would otherwise be drawn off for driving feed pumps with electric motors. First of these steam-turbine-driven boiler feed pumps is due for delivery in May.

Turbine drives for process pumps boasting speeds of 10,000 rpm are on the way. Because high-speed pumps and drives can be made smaller for a given capacity and head, significant capital savings are possible for installations large enough to use such capabilities.

Pumps for all applications are being constantly improved, with particular regard to packings and seals. Particularly for process, rather than powerhouse applications, considerable work is being done on applying new materials to pump construction to handle the increasing varieties of corrosive materials found in industry. Making some of the most dramatic strides are the canned pumps originally developed for nuclear energy applications. These canned pumps comprise a single pressure-tight vessel enclosing the pump impeller and its electric drive motor. Fluid being pumped circulates throughout the drive motor—bearings, rotor, and stator.

Usefulness of canned pumps for conventional power plants is demonstrated by the first installation of such a pump in Possum Point Station of Virginia Electric Power. This pump circulates 4700 gpm of 605 F water at 1725 psi. It is driven by a 150-hp, 1800-rpm motor. There is no leakage because the entire pump is hermetically sealed. It is small and light for its capacity. Instrumentation consists merely of a cooling water flow indicator and a pump-bearing temperature thermocouple, both connected to buzzer and lights. There are no external shaft seals, so maintenance is at a minimum.



Cooling Tower Institute and The Marley Company

Cooling towers are ever more important in the power services because the need to conserve water supply is getting to be one of hard economics.

Valves

Reliability is becoming more important in valves, especially due to the effects of higher cycling rates on the length of operating life. To achieve this, valve construction is being made more rugged, compact, and simple. Because of industry trends to more automatic control, solenoid valves are finding extensive use. They are ideal for use with interlocks and control devices where sequencing or close control is desired.

In spite of more stringent industry standards there is still some price shopping in the valve market—without too much regard for ruggedness and actual life expectancy in service.

Piping

Piping systems are benefiting from the development programs in steam generation aimed at higher temperatures and pressures. Improved alloys result from such work. Plastic piping is used for more process lines because of the special corrosion-resisting properties of specific plastics for specific liquids. Light weight is an advantage of plastic piping that also

makes it attractive. New valves and assembly techniques are pacing wider and wider use of this new material in piping.

Heat exchangers are benefiting from continued research in piping. Aluminum for wide use in heat exchanger tubing is in the offing, though some manufacturers are still reluctant to be specific about their experiences with aluminum so far. Heat exchangers will be built for higher pressures and temperatures. Atomic energy and gas turbine applications plus changes in process technology will demand changes in heat exchangers. Trend is toward low chrome alloys and stainless steels.

Chemical techniques are becoming more prevalent for piping cleaning, especially in boilers, heat exchangers, and process equipment. One recent development does away with the strips of copper often found plated out in drums and headers after chemical cleaning. A special copper solvent is first allowed to soak in the preheated piping, then flushed out. Regular chemical cleaning agents are then used, with no copper formations resulting. Such advances in chemical cleaning techniques help to make chemical cleaning more popular.

ANNUAL REVIEW AND FORECAST

Fuels

Competition in fuels and firing equipment was never stronger.

FUEL FOR INDUSTRY is a domain that is perhaps the most fiercely competitive within the realm of Industry's Power Services today. Nulcear power, coming in on the heels of long-standing competition among the fossil fuels, is increasing the pitch of the competition even beyond the established coal-oil-gas competition.

Latest Federal Power Commission figures on consumption of fossil fuels show that for the year ending September 30, 1955 compared to the year ending September 30, 1954 utilities used 16.4 percent more coal, 4.6 percent more oil, and 2.2 percent more gas. (Utilities, admittedly, are the best power-business customers of the coal industry.)

Reversing the recent trends toward declines in sales to industrial powerhouse customers, the coal industry is now recording a growing "trend back to coal" among these customers. The pace of increasing coal usage by industrial plants is expected to continue through 1958, at least. Chemical and paper plants, among the industrials, are leading the way in the return to coal.

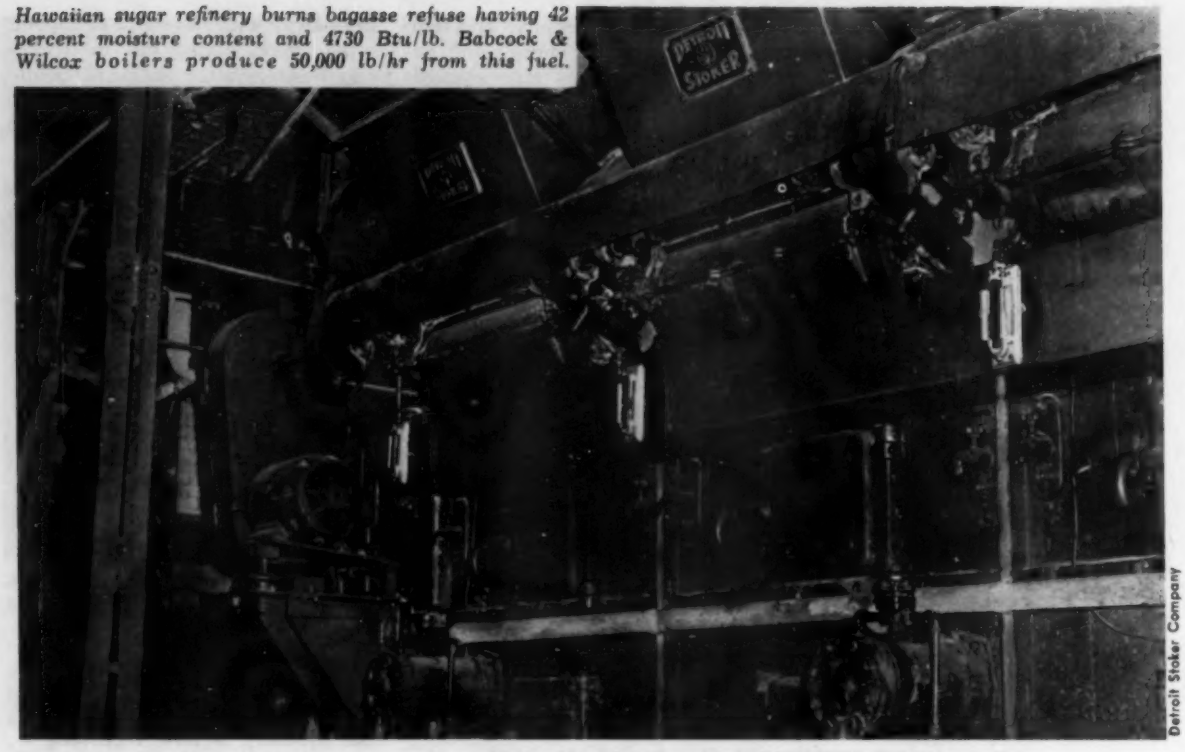
This trend back to coal is ascribed to the immediate prospect of increased costs for residual oils —an outlook that indicates to some (coal producers, at least) that oil has had its day. They point out that refiners do not find residual oils profitable and so are seeking methods for extracting higher grade stocks from their residuals. In extracting more valuable fractions from residual stocks, the so-called delayed and fluid cokes are produced—but not in quantity that makes up for the residual oils thus consumed.

On the other hand, ample supplies of residual oils are available from foreign sources. If imports are restricted (as presently indicated), oil prices will advance. This may give some price advantage to coal, increasing demand for coal, and ultimately forcing coal prices up. Add to this the effects of rising wages for miners and rising transportation costs—and it is

American Coal Burner and Wood Stoker Corporation

Multiple-burner spreader stokers are racking up service in North Carolina hosiery mill. Boilers are each rated 183 hp. Each stoker has 35 sq ft of grate.

Hawaiian sugar refinery burns bagasse refuse having 42 percent moisture content and 4730 Btu/lb. Babcock & Wilcox boilers produce 50,000 lb/hr from this fuel.



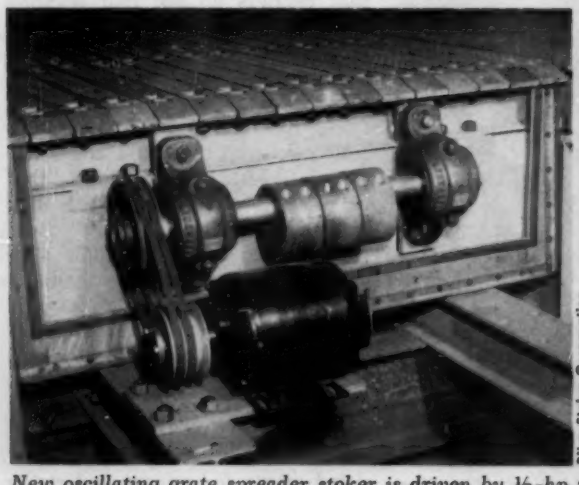
Detroit Stoker Company

evident that coal prices may not remain lower than imported residual oils that are priced with inclusion of a tariff.

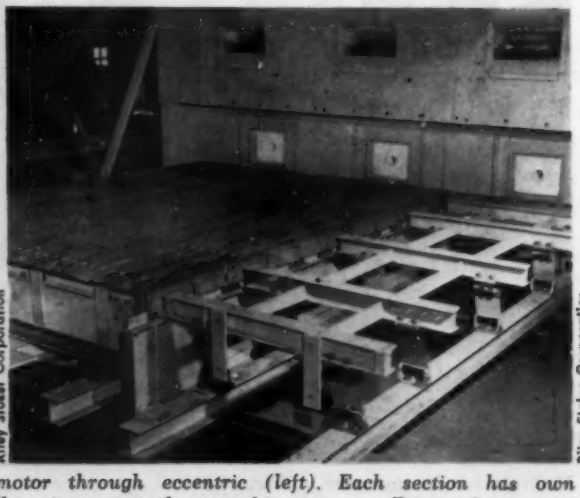
Because such economics as these are the chief factors in the fuels picture, utility and industrial operators are steadily going to multiple-fuel firing. This enables them to take advantage of current price structures in their own areas, structures that continue to prove quite variable over relatively short periods of time.

Multiple-fuel firing in small plants is being stimulated by the recent development of the coal-fired package water tube boiler equipped to also burn oil and gas. Changeover can be accomplished in 60 hours on the 12,500 lb/hr unit just tested by Superior Combustion. Their boiler is a prototype for the 10,000- to 25,000- lb/hr range. Foster Wheeler is building a prototype for the range 30,000 lb/hr and higher.

Slag-bottom furnace designs are available for multiple firing of wide quality ranges of coals, oils, gases, lignite, delayed and fluid cokes, and flyash from adjacent boilers of conventional design.



Riley Stoker Corporation



Riley Stoker Corporation

New oscillating grate spreader stoker is driven by ½-hp motor through eccentric (left). Each section has own drive. Combined sections (right) can be timed to oscillate intermittently to achieve most efficient firing rate.

Turbulent combustion air is provided in combination with radiated heat from the slag pool to effect nearly 100 percent combustion of the low volatile fuels.

The fluid coke picture is indeed "fluid." Depending on the analysis of the crude from which it is made, the carbon content of fluid coke may run from to 65 to 90 percent. Ash content is likely to be well under 1.0 percent. In one area where careful cost studies were made, fluid coke was available to an industrial at $5 per ton. Equivalent value on a Btu basis of natural gas in the same area would be about $9.25, and of fuel oil about $9.75.

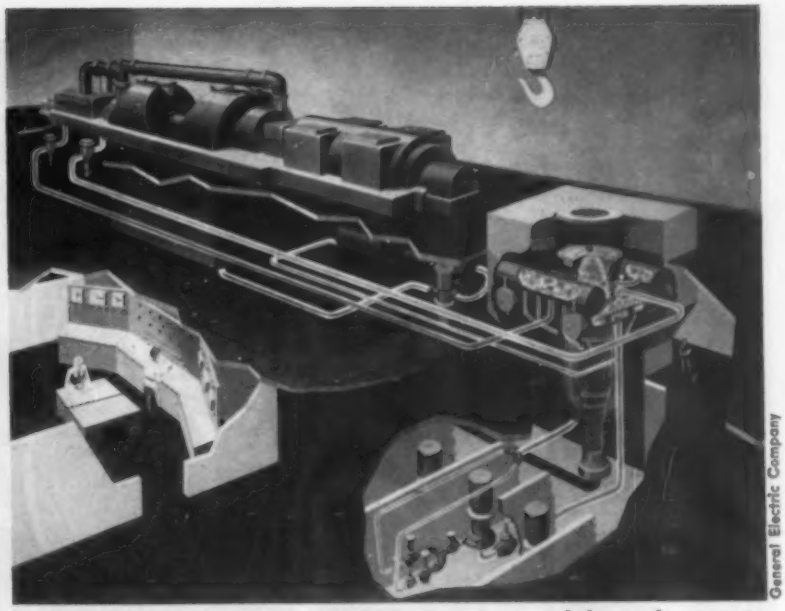
Geography is very important in determining the economic advantage of fluid coke. It is a dry, fine granular substance that becomes pasty when wet. Therefore, it must be transported and stored under cover. The refinery must be fairly close to the user. Long-term agreements between buyer and seller are almost mandatory. Fluid coke of very high carbon content can be used as a raw ingredient in certain manufacturing processes so that better grades of it might not be available for use as fuel.

Refuse firing

Refuse firing is becoming more important. Cellulose-base wastes of high moisture content are being burned more extensively. Metering techniques are becoming most important in feeding refuse fuels.

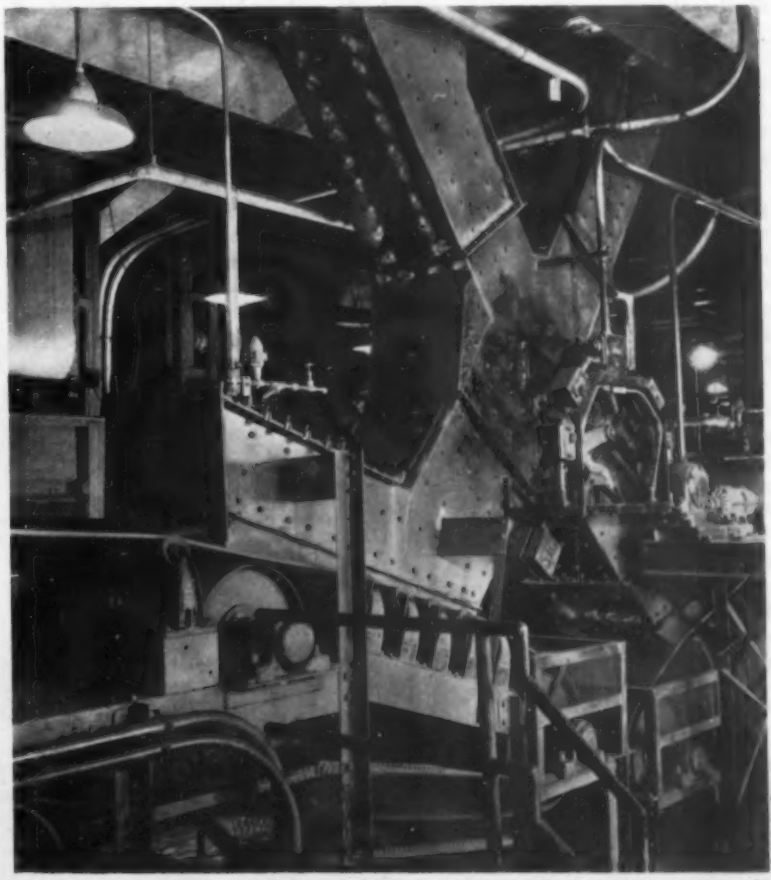
A special case of refuse burning —flyash reinjection—is reported to hold great promise for eliminating flyash disposal problems as well as improving basic fuel economy. Many unusual types of refuse obtained from process chemical and water recovery systems are being burned successfully — with moisture often near 50 percent.

Automation in steam generation is being aided by more automatic coal and ash handling. Dirt and back-breaking hand labor are outmoded in modern plants. Development of more accurate control of fuel and air over a wide range of load conditions meets customer demand for automatic operation over wider load swings. One utility, at least, has already installed O_2 compensated combustion control. Wide-



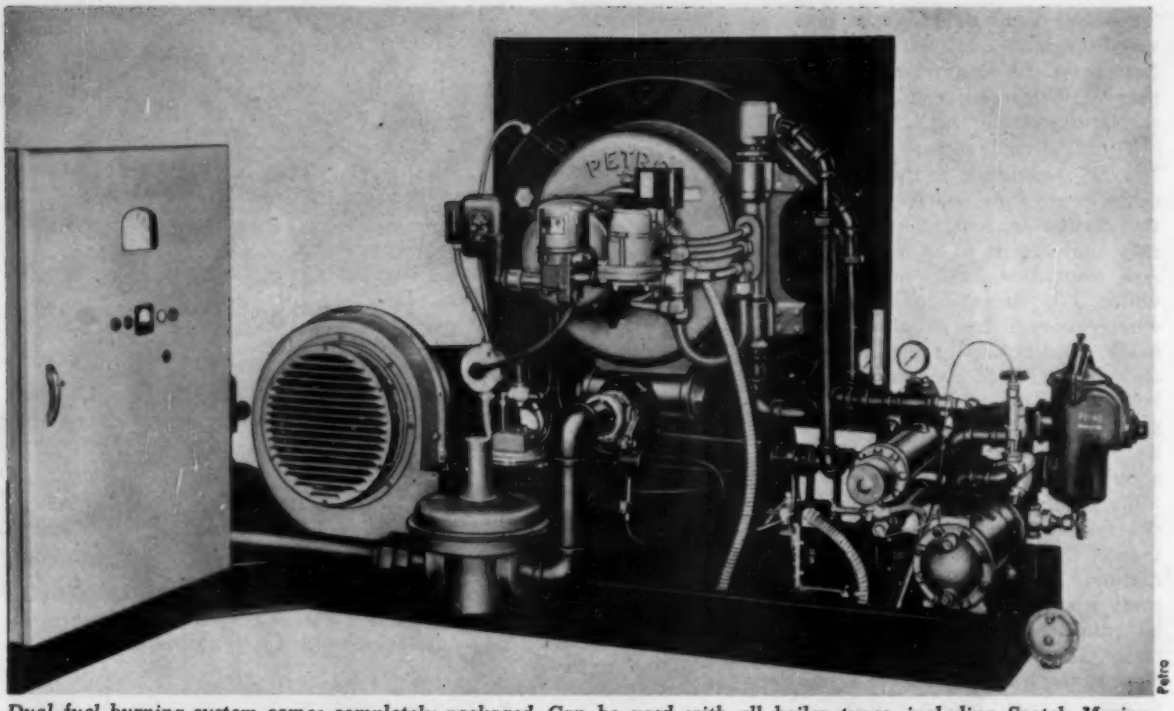
General Electric Company

Dual-cycle boiling reactor might look like this when coupled to turbogenerator in 180,000-kw plant. Model is for Commonwealth Edison station near Chicago.



Link-Belt Company

Distributing arrangements between belts and chutes afford maximum versatility in this coal-handling system. Maximum rate of 1600 tons/hr is possible.



Dual-fuel burning system comes completely packaged. Can be used with all boiler types, including Scotch Marine.

spread adoption of this control refinement seems likely. O_2 content of flue gas is a constant guide, regardless of fuel burned.

Several other new plant features point toward more automatic operation. Improved self-cleaning stoker grates are being introduced for smaller units. The package concept for solid fuels with controls and accessories included is being advanced. Longer life, lower maintenance, and less operating attention are features of firing equipment and their accessories. These factors become more important, particularly in larger sizes, because bids are most often invited on the basis of rigid customer specifications and industry standards. The chief purchasing problem for the buyer of firing equipment, as well as of boilers, then becomes one of price paid for quality received.

Atomic power

Twenty-three percent of all installed power generating capacity in the United States will be atomic 25 years from now, according to latest predictions. Technology underlying nuclear power plants in sizes and capacities for the industrial powerhouse may make them economically competitive with fossil fuel plants by 1958. More conservative observers see nothing in the present situation to indicate that nuclear reactors will be significant for industrial power plants for at least five to ten years. Atomic enterprise in total, nevertheless, is doubling every two years. Atomic generating capacity is expected to double every four years between 1960 and 1980.

These predictions do not go unchallenged. The degree of optimism that is justifiable for nuclear power is itself the object of great debate. But AEC Chairman, Lewis Strauss has just recently stated that present high optimism may be proven puny indeed if certain likely technological breakthrough are achieved.

Chief uncertainty to be resolved is the matter of reactor type. Other major problems facing nuclear power are availability of insurance protection and disposal of waste products. But nuclear power plant capital costs are definitely coming down. After the first few reactor plants already on the designers' boards are put on the line, enough experience is expected to have accumulated to assure that the costs of reactor steam will slide into the range of equivalent conventional-boiler steam.

Particularly significant to industrials are nuclear reactors for plants in the 10,000-kw range. On the basis of presently known technology, producers of the Army's Package Reactor predict that a nuclear power plant in this range could be operated for just ⅓ more than a conventional plant. Present purchase price of a 10,000-kw nuclear plant would be 1½ times that of a conventional plant. Small municipals and individual industrials are predicted to benefit greatly from further development of reactors in this range.

Direct conversion

Direct conversion of conventional fossil fuels to electricity without going through a thermodynamic cycle is a possibility near enough to actuality to disrupt all of the present jockeying for position between nuclear and fossil fuel interests. Some observers expect that by 1980, "carbon cells" may be fully developed. It is already reported that electricity has been produced, in Germany, by a prototype.

ANNUAL REVIEW AND FORECAST

Wastes

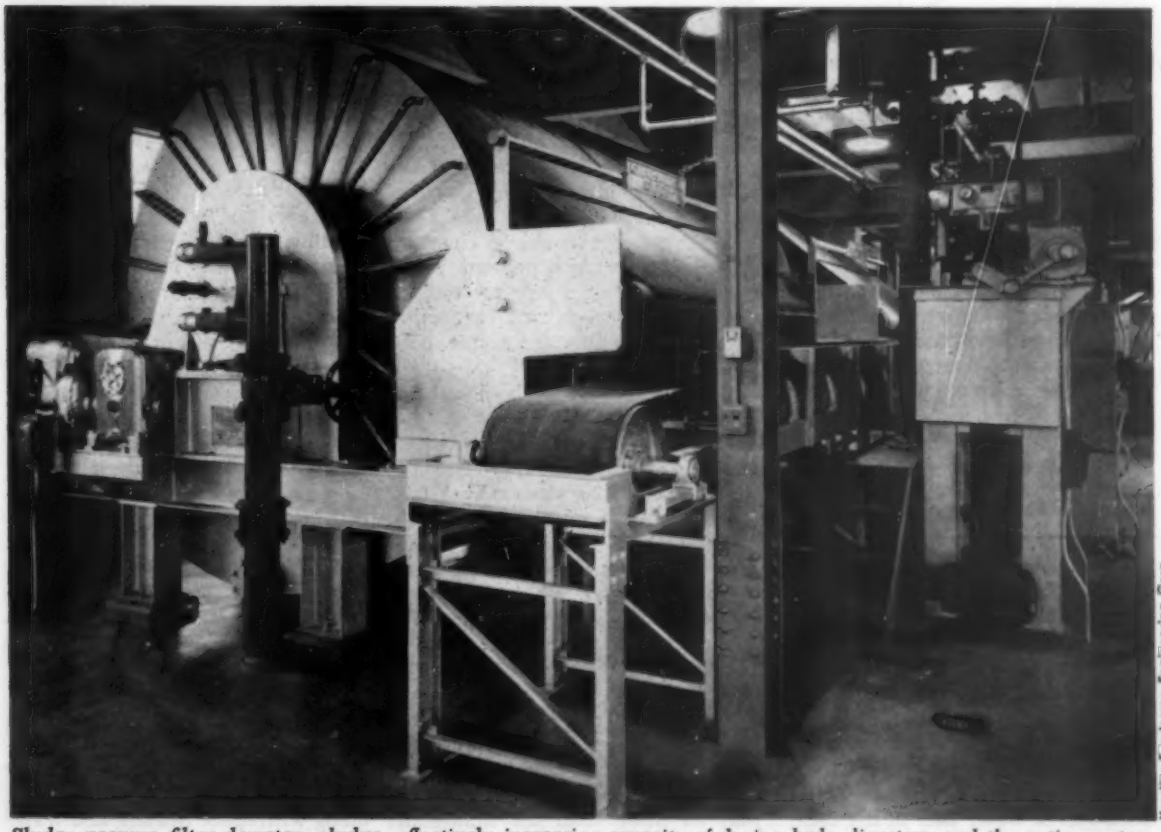
Pollution control and disposal of solids by incineration are of timely concern.

HANDLING OF INDUSTRIAL wastes is reaching a degree of maturity, according to competent authority, just beyond adolescence. Early teachings are gaining adherents to the point where control of airborne, waterborne, and solid waste products is a welcome and preplanned adjunct of industry—indeed, a newly but firmly matured segment of Industry's Power Services. Industry is becoming increasingly aware of the fact that treatment of its wastes is as much a part of manufacturing as is the actual process itself. And industry is buying its waste treatment facilities, for the most part, on the basis of quality, rather than price.

Most outstanding in the progress of industrial wastes disposal is the trend toward area-wide control of airborne and waterborne effluent. Many outstanding examples are available of great achievement on such levels—reflecting new thinking coming into wide acceptance. The essence of this new thinking is that while pollution may be a problem of local character, its consequences are regional and often national. Therefore, it demands the concern of bodies having broader jurisdiction than individual municipalities. So industry is finding itself responsible to regulating authority having greater breadth of domain than its municipal hometown. And many examples can be cited to document the trend wherein industry is not only a responsible party, but where it is a positive force supporting such regional regulating bodies.

Air pollution

Fuel burning equipment received the earliest attention in air pollution control work under the original smoke ordinances. Most of the answers have been found and are in practice for preventing smoke emission from large coal-,

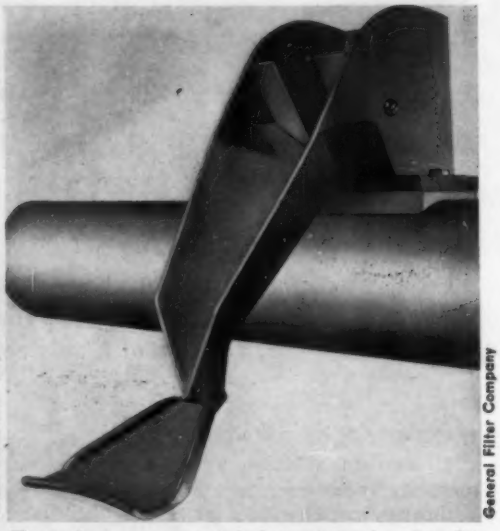


Kamline-Sanderson Engineering Corp.

Sludge vacuum filter dewaters sludge, effectively increasing capacity of drying beds, digesters, and the entire system.

Godar Incinerator Corporation

Typical of incinerator installations in built-up areas is this 2500 lb/hr unit. Notice the floor-level door for easy charging.



General Filter Company

Typical of new materials being introduced is this aluminum distributing head for trickling filter.

oil-, and gas-fired units. Flyash collecting equipment is available for all types of solid-fuel burning equipment that will comply with existing restrictions. Flyash from larger units burning residual oils is a problem presently being evaluated. Effects on area-wide pollution from this source will be reported on soon.

SO_2 content is a new performance standard being studied with regard to stack emission from fuel-fired units. Many technical groups are giving attention to this problem. New developments can be expected soon.

Industrial internal-combustion engine exhausts are another problem getting current attention. Stopgap measures for treatment of exhaust gases can be expected in the immediate future. More efficient combustion is a long-term goal to be sought in engine design.

Water pollution control

Chief matter of wide interest in water pollution control is reevaluation of fundamental criteria. In one realm, there is much reexamination of the propriety and wisdom of regulation by maintaining standards on effluent versus regulation by maintaining standards on the main stream.

In another realm, reconsideration is being given to fundamental doctrines of water use. In the East, the custom has been to recognize the common-law doctrine of riparian rights. Each owner fronting on a body of water is free to use it, but must pass it on downstream in essentially the same condition as he receives it. In the West, however, the right of prior appropriation is most commonly recognized. The first party making use of a water body has first right to it, with no obligation to maintain its quality or quantity as it goes downstream. There is some agitation to invoke the doctrine of prior right in areas in the East that have long recognized riparian rights. If the trend toward prior rights should gain any ground, it could nullify much progress in the regional programs for water pollution control.

Great attention is being given to biological treatment of industrial wastes and to treatment of plating wastes. Recovery systems that help pay for themselves out of the value inherent in the recovered pollutant are showing up in increasing numbers. This is particularly true of the recovery processes used on plating wastes. To help reduce the magnitude of plating wastes to be handled, several techniques are being used: use of fog or spray rinses, use of ion-exchange or chemical treatments, and better control of solutions (particularly rinses) to be sure that no more than the minimum needed is used.

Recovery systems for other than plating wastes give rise to many economies, also. Food processors, for example, recover substances with high fat or high protein content that can be sold for fertilizer. Effluent from hydraulic debarkers in lumbering can be filtered, the recovered material being used as powerhouse fuel. The trend toward burning refuse for power is indeed growing in industry.

Incineration

Disposal of solids, as such, is tending toward in-plant incineration. Use of one large incinerator remote from plant buildings is being outmoded by individual smaller incinerators, each located nearer the primary source of waste. This permits adaptation of each unit to the particular kind of waste coming from a production area. Burners and special chambers may be tailored to handle collected dusts, paint sludges, plastic residues, or other such special wastes. Even where this is not feasible, the trend still is to smaller units, with continuous firing rather than intermittent charging and shutdown.

The day is passing when wastes are merely heaved into boilers or hot water heaters. Over the long run, it is expected that incinerators will be routine equipment installed along with space heating and water heating equipment.

ANNUAL REVIEW AND FORECAST

Mechanical Power

Adaptability to automation is key feature demanded.

Dodge Manufacturing Corporation

New "dry-fluid" drive transmits power from ¾-hp motor to V-belt drive.

The Cleveland Worm & Gear Company

Worm gear drives rated 139 hp at 450 rpm are destined for steel mill service.

HIGHER SPEEDS, larger loads, economy, simplicity, convenience, and (most important) adaptability to automatic control are features pacing progress in mechanical power transmission.

Turbines for mechanical drives are making significant advances into fields of industrial application. High-speed units, in particular, are coming into prominence for driving centrifugal compressors and blowers. A typical compressor drive might be rated 1910 hp at 9150 rpm. Turbine drives achieving speeds of 10,000 rpm are being developed to meet the needs of modern high-speed processing.

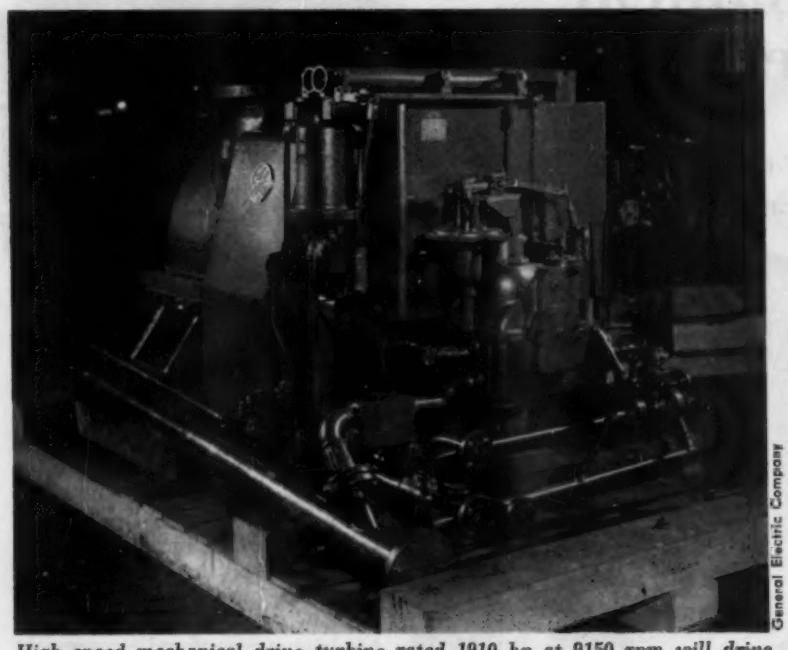
Clutches

Trend toward simplification and sensitivity of control is being reflected in growing use of air clutches. Less skill is required from humans to smooth out operations, because air clutches have fingertip controls, permitting "inching" of large pieces of equipment such as sections of block-long paper machines. Economy is achieved with air clutches because they require no adjustment—reducing maintenance time. They permit centralizing of controls.

Simplicity is being advanced also through introduction of "dry-fluid" drives and couplings. Just recently announced, these drives will appear on thousands of electric motors and gas, gasoline, and diesel engines during 1956. Dry-fluid drives and couplings permit prime

movers to start loads smoothly and to accelerate quickly to full load. These compact units absorb shock and overload, smoothing out operations and averting damage to valuable equipment.

Conventional fluid couplings continue in wide use. They provide a cushioned grip between driving and driven machine. They permit selection of electric motors on the basis of running requirements rather than starting requirements, often permitting a smaller motor. They isolate shock loads. They free motors and engines when stalling or lugging is imminent. They transmit full torque at all times.



General Electric Company

High-speed mechanical drive turbine rated 1910 hp at 9150 rpm will drive centrifugal compressor. Units of this type are rated up over 10,000 rpm.

Allis-Chalmers Manufacturing Company

Popularity of V-belt drives continues. This is typical modern installation—a 30-hp motor driving a Buell dust collector at Mississippi Lime Company.

Another contribution to simplicity, economy, and efficiency follows from the growing use of shaft-mounted speed reducers. Ranges of sizes and capacity are being extended. Mounted directly on the shaft and anchored to a fixed object by a torque-arm, this type of reducer requires no foundation, no motor rails, no flexible couplings. They occupy less space. Extended horsepower capacity now makes possible ranges from 1.3 hp to 60 hp at 100 rpm. Speeds may range from 12 to 365 rpm. This type of reducer can now be used on shafts that may be as large as five inches in diameter.

Bushings

Simplicity and efficiency are also gained in increasing use of the taper-bushed principle of mounting and locking wheels to shafts. Originally applied to V-belt sheaves, the taper-bushing principle was extended to conveyor pulleys, rigid and flexible couplings, and then to silent and roller chain drives. This past year has seen further application of tapered-bushings to chain sprockets and to the dry-fluid drive couplings. Meanwhile, scores of manufacturers have been adapting the tapered-bushing to a variety of additional products.

And as the number of products in which tapered-bushings are used increases, advantages of standardization and interchangeability are also more noticeable. Interchangeability is an increasingly important factor in another trend that involves convenience to users of mechanical power. All of the products mentioned above are readily available from local industrial distributors throughout the country. This makes possible selection of virtually packaged power transmission units locally "right off the shelf."

Simplicity of design, selection, installation, operation, and maintenance all lead to greater economy, efficiency, and convenience. This is the pattern of the progress coming in mechanical power transmission.

ANNUAL REVIEW AND FORECAST

For All Power Services

Instrumentation and Control
Fire Extinguishing
Lubrication

MOST UNRELENTING of all trends in Industry's Power Services is the trend toward centralized control. Plant management, in fact, is viewing this trend as far more than just "desirable." Centralized instrumentation and control is becoming a bona fide necessity.

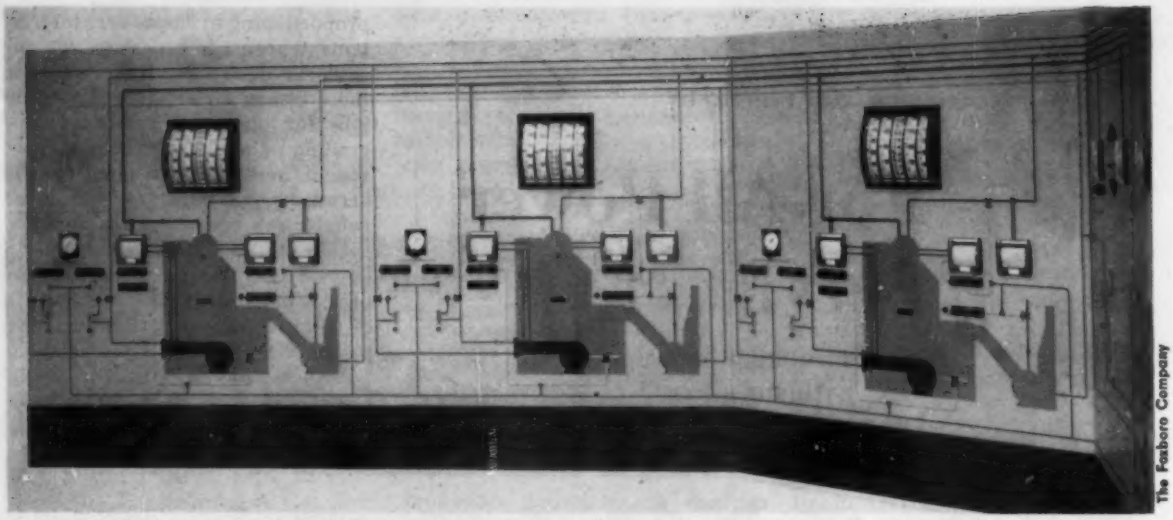
Developments in instruments and controls are following directions highly compatible with centralization — continuing miniaturization, greater reliability, improved readability, expanded ranges and capacities, versatility through precalibrated plug-ins, and ruggedness to withstand industrial environments. One of the important developments is anticipatory time-proportioning in controllers for systems where compensation for inertia is desirable. Net result of these trends is reduction in routine jobs for operating personnel, upgrading of skills in operating personnel, and increased plant output because longer periods of sustained, satisfactory operation are possible.

Centralized control has gone far beyond mere grouping of instruments and control in one room. It is going even beyond the graphic panel — popular as the graphic panel remains. Control is being centralized with close attention to "gage grouping" so that closely related functions are kept physically close together in the array of controls to be operated.

Another evidence of increased planning for operator convenience and improved control is growing use of "pointer patterns." Pointer positions are planned to be alike during normal operation, with abnormal conditions causing a pointer to shift away from the established pattern. The "off-normal" position

Bailey Meter Company

Centralized control for generating station puts all control in minimum space. This room controls 1,200,000-lb/hr unit.



The Foxboro Company

Refinery boilerhouse control panel shows advantageous use of graphic panel techniques to aid operator comprehension.

of any pointer is then quickly apparent. In one system, a set-point pointer is completely covered by a controlled-variable pointer during "on-process" operation. When the variable drifts, however, the set-point pointer is uncovered. Different colors are used on the pointers to aid comprehension.

Many versatile arrangements are being worked out to simplify power services instrumentation at the same time that applications of instrumentation itself are extended. Pumping operations on one pipeline, for example, are arranged for automatic selective control in which valves are operated in response to either suction pressure, discharge pressure, or motor load — depending on which variable the control system senses as being closest to its own critical limit. Maximum operating smoothness at top capacity is achieved as control selectivity shifts from one variable to another as their relative criticalness shifts.

Barber-Colman Company

Ease of maintenance and flexibility are inherent with plug-in control.

Another approach to selectivity is in scanning-control centers. They scan operation points and provide correction control for many parts of an observed process. In one unit, for example, temperature readings at 72 stations are scanned in 4 minutes, with visual and audible alarms indicating when a station temperature begins to go beyond preset limits.

Controversy between electronic, pneumatic, and hydraulic instrumentation is settling down to a general agreement of sorts. More electronic instrumentation will be used as time goes by. But pneumatic and hydraulic instrumentation will maintain their respected place in the field for some time to come. There is nothing that electronics can do that, technically, pneumatics or hydraulics cannot do, though the adaptability to given functions undoubtedly varies from one type of system to another. Application of electronic systems for control brings about consideration of the relationship of the actuator to the method used. Pneumatic actuators may be operated by electropneumatic pilots. Electric motor actuators are more prevalent due to the increased use of electronic control. Competition rests on such factors as reliability, response time, first cost, maintenance, and convenience in incorporating data-logging and computing devices into the control system.

Chiefly responsible for the inroads that electronic control is making is its versatility. Multiplexing of many functions on a single circuit can be done on a continuous or selective basis. Distances covered can be extended from "feet" to "miles". Fail-safe features are being built into modern systems. Maintenance techniques are being simplified to take the strange "electronics flavor" out.

Instrumentation and control is heading toward higher standards, more intense competition among suppliers, more diversification in capability, better quality for less money — all as the result of industry's persistent inclination to get more "automatic." Continued study of the control loop brings the terms "dynamic response" and "dynamic analysis" into the limelight. Control system components are being evaluated more and more on the basis of their relationship to each other for best operation of the system. And, as one of the foremost manufacturers hints, nuclear energy will undoubtedly inspire new achievements in instrumentation and control that will

further spur all of industry along its rush toward increasing its automation consciousness.

Fire extinguishing

There is a decided trend away from carbon tetrachloride portable extinguishers, with accompanying increase in use of dry-chemical (specially treated baking soda) portable extinguishers. Biggest step forward in recognition of dry-chemical fire-fighting equipment is the recent Underwriters' Laboratories approval given to dry-chemical piped systems—the first approval ever given to this system by a recognized approval agency. It is predicted that dry-chemical piped systems will find wide application around transformer vaults, paint-dip tanks, spray booths, ovens, oil-quench tanks, diesel and gasoline engines, and flammable-liquid storage.

Carbon dioxide is holding its own as an extinguishing medium, especially where it is desirable to avoid accumulations of extinguishing material; carbon dioxide offers this advantage over dry chemical extinguishing systems. Carbon dioxide is being widely used for generators, enclosed transformer vaults, spray booths, quench tanks, and flammable-liquids storage.

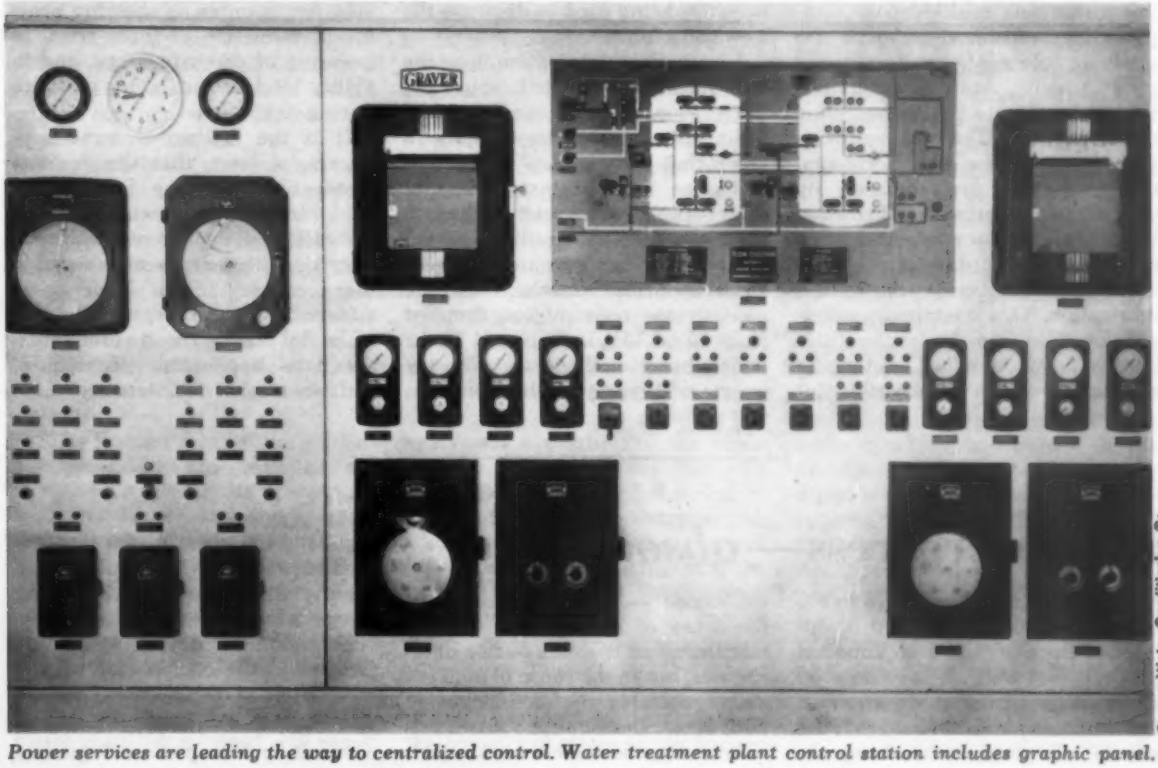
Fire protection is one field where there is almost universal agreement that price is not a primary consideration. Yet, it is a highly competitive field. The industry is uniting, however, to promote wider use of portable extinguishers, and to establish industry standards for recharging portable extinguishers.

Lubrication

Trends in lubrication follow the general pattern of industry thinking in that power-services engineers are asking for multipurpose lubricants and simplification of techniques. The first demand — for multipurpose lubricants — is being met with new compounds being released almost continually. Yet, there is strong feeling among some lubricant producers that the idea of a multipurpose lubricant is too often confused with that of an allpurpose lubricant. While it is true that much progress has been made in compounding lubricants so that one may do the job formerly requiring two or more, it is not possible to say that an all-purpose lubricant has been developed that will adequately serve all industrial situations. Industry is developing new challenges for lubricants as fast as multipurpose compounds are created for existing

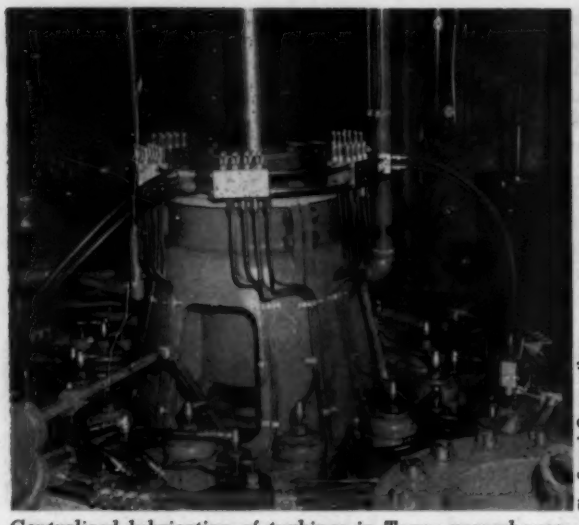
The Farval Corporation

Lubricant is sprayed on pressure side of gear teeth in spray valve method.



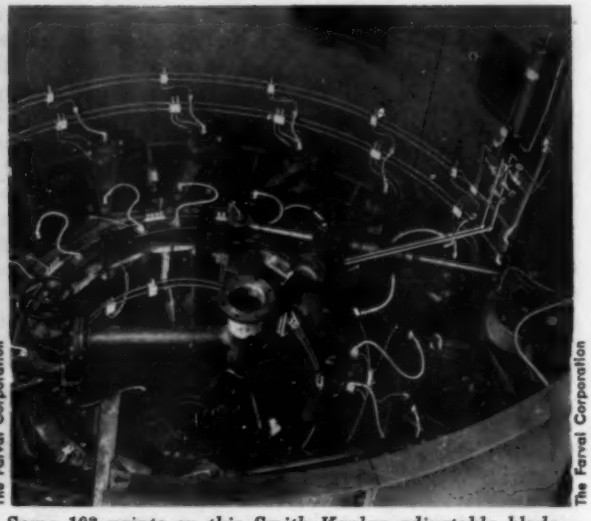
©raver Water Conditioning Co.

Power services are leading the way to centralized control. Water treatment plant control station includes graphic panel.



The Farval Corporation

Centralized lubrication of turbines in Texas powerhouse takes care of 80 critical points on each from one pump.



The Farval Corporation

Some 103 points on this Smith-Kaplan adjustable-blade turbine are lubricated by centralized lubrication system.

problems. These challenges come from the persisting inclination to run equipment for longer periods between shutdowns and to run at higher loads, greater speeds, and within wider temperature limits.

The second customer demand — simplification — goes beyond reducing the number of lubricants needed in a plant in favor of stocking just a few multipurpose compounds. Centralized systems for applying lubricants are being used more widely. Automatic application of lubricants is also becoming more popular. The net result is that forgetfulness and accidental misapplications are replaced by well-planned periodic lubrication with the correct compound. Oil-mist systems afford extremely economical and efficient centralized lubrication. Oils containing colloidal graphite can be successfully "fogged" in standard automatic equipment where inaccessible locations or severe ambient conditions preclude use of other lubrication methods.

Spray types of application techniques are coming into prominence. Colloidal dispersions of solid lubricants in volatile carriers permit quick and easy formation of dry lubricating films by swabbing, dipping, or normal spraying. Aerosol cans are being used to dispense the new solid lubricants.

Direct spray lubrication is on the way for large bull, girth, spur, and herringbone gears found on ball mills, kilns, and similar equipment. Operating data is now being collected on the first installations of direct-spray techniques applied to large gears. Initial results show decreased lubricant consumption over swab application methods. In one case, grease consumption dropped from 20 or 30 quarts per 24 hours under hand methods to only 4½ quarts with spray application. Materially lengthened gear and pinion life is reported, as well as reduced downtime, reduced lubricant spillage, and reduced cleanup.

Along with the trend to centralized automatic lubrication, there is increasing awareness of need for adequate filtration of recirculated lubricants. Full-flow filtration of lubricating oils on stationary diesels, for example, is showing progress in reduction of filter sizes, in lowering of pressure drops, and in ability to clean out larger particles during operation.

It is the feeling of some producers, at least, that the greatest "competition" in the lubricants field comes from the users themselves. Either they do not realize or they do not care to acknowledge the great savings in labor costs, materials costs, and downtime possible by using good lubricants, adequate application techniques, and preventive maintenance.

Key to progress— *obsolescence*

If American industry were in the habit of keeping equipment in operation until it failed to function properly — well, it wouldn't be American industry as we know it. In fact, it can almost be said that the key to our progress has been obsolescence — not obsolescence in the sense of reluctantly replacing machinery as it wears out or deteriorates, but in the sense of deliberately replacing good machinery with better machinery. . . .

Actually, obsolescence is as much a state of mind as it is a physical measurement. It should be a healthy dissatisfaction with doing things less well than they can be done; then individual companies go forward in the competitive race.

Association of Consulting Management Engineers

In brief....

ASME Fall Annual Meeting

CLIMAX of the ASME's Diamond Jubilee year was the annual meeting recently held in Chicago in conjunction with the Power Show (see INDUSTRY & POWER, December 1955, page 58). Theme of the meeting was "The Engineer and the World of Commerce and Industry."

Progress in electric power generation

J. B. McClure
A. G. Meller
General Electric Company

"If, as predicted, the demand for electric power doubles in the next 10 years it will be necessary to add over 100 million kw of new generating capability by 1965, in addition to replacing any old, obsolete generating capacity that may be retired. An extension of developments presently underway can provide a picture of what this new generating capacity to be added will be like and what will be some of the future trends. . . .

"As indicated previously, new hydroelectric installations can provide only a small part of our future power requirements. By 1965, electric power from atomic energy may be supplying a part of our requirements but it seems certain that the major source of power for some time in the future will be fossil-fueled steam-electric generating stations.

"The present trend to larger single generating units can be expected to continue. As power systems get larger and more interconnections between systems are installed, it will be possible to install larger generating units without incurring any appreciable penalty in extra reserve capacity. The expected lower installed cost per kilowatt of the larger units and their lower operating and maintenance costs per kilowatt will result in an overall economic advantage. In addition, it now appears that to obtain the full potential advantage of very high steam conditions, large turbine-generator units will be required. . . .

"In conventional condensing steam-electric stations the rejection of the latent heat of condensation to the circulating water accounts for the major loss of heat and corresponding reduction in efficiency for the overall cycle. Many processes requiring large amounts of heat use steam at low or medium pressures and use all the latent heat of condensation in the process. By generating steam at high pressures and temperatures and employing condensing-extraction turbines with extraction steam exhausting to the process, electrical energy may be generated at approximately 4000 Btu/kw hr. Several installations have been made in this country on a cooperative basis between the electric utility and other industries requiring process steam, and it is expected that the future will see many more of these advantageous installations.

"The recent development of larger sized gas turbine-generator units will make this type of unit applicable to larger power systems. The present fuel situation has been discussed previously. The development of a coal-burning gas turbine which would be applicable to a larger number of the country's power systems has been given considerable attention in the past few years and a solution to the problems involved will very likely be achieved in the next few years.

"One of the most attractive possibilities for more efficient power generation in the near future is the use of a combined gas turbine-steam turbine cycle. . . . . In this cycle the gas-turbine compressor supplies combustion air to a boiler at a pressure of several atmospheres. Combustion takes place in the boiler, and steam at any desired pressure and temperature can be produced. The products of combustion leave the boiler at a temperature high enough to be suitable for operation of the gas turbine."

Combustion calculations for multiple fuels

T. Buna
Riley Stoker Corporation

"Whether a single fuel or a plurality of fuels is fired simultaneously, the calculating and reporting of steam-generator performance on the basis of a single fuel analysis and heat content as a reference datum is both possible and desirable. Possible, because the laws of conservation of matter and energy, upon which all combustion calculations are based, are independent of the degree and nature of mixing of the various steams entering and leaving the system. Desirable, because to any number of fuels fired simultaneously, there corresponds only one flue gas analysis and temperature, and performance items such as the weight of air supplied per unit weight of fuel, excess air, items of heat balance (heat losses), and efficiency of the steam generator cannot be determined with reference to each component fuel individually.

"Basically, therefore, combustion calculations for single and multiple fuels only differ in the determination of the fuel analysis and heat content, which, in the case of the multiple fuel cannot be obtained by direct laboratory procedure and/or temperature measurement, but must be computed from the analyses of heat contents of the component fuels and their proportions in the multiple fuel.

"If the firing rates of all component fuels are known accurately, this computation is a rather simple procedure."

(continued on page 66)

ASME Fall Annual Meeting

. . . starts on page 65

System of charging for steam in industrial plants

L. J. Sforzini
C. A. Winslow, Jr.
Eastman Kodak Company

"When both steam and power are produced the problem becomes: should the steam users be credited with all or part of the savings arising from the power byproduct production incidental to steam use over an alternate source, say, either by condensing operation or purchasing the power? Or, should the steam users be charged for heat use at the same unit rate as power production, allowing the savings from the favorable balance to remain with the power producers? There are users and advocates of both methods....

"'Divided savings' systems must be based on assumptions made by engineers and accountants, or compromises by both, and usually no two systems in different plants will be found alike. In relatively simple plants with one or two steam pressures such a system might meet requirements and show logical results. However, if a plant expands and other pressures and equipment are added, and also if steam is used for utilities other than power generation, calculated savings in justifying expansion programs may show up as apparent losses on the cost sheets. As a result, continuous arbitrary modifications must be made.

"One such system for supplying both process steam and back pressure and condensing power calculates power under condensing operation and allows steam to be the beneficiary of the combined production.

"The system developed by the authors may be described as a 'Btu System.' The steam charge made against any piece of steam-using equipment is for the Btu it uses. In effecting changeovers from arbitrary systems it was found necessary to retain the concept of 'pounds of steam' since production-plant operators through long use had become accustomed to the term and were reluctant to relinquish it. So we employed the term 'standard pound of steam' and defined it as the addition or removal of a 1000 Btu of heat from a quantity of steam, or water, regardless of pressure or temperature conditions.

"In calculating cost of steam production, the boiler output in multiple pressure and temperature plants is converted to 'standard pounds of steam,' or Btu, and a unit cost of production calculated. Off hand, it may seem that there should be an appreciable difference in cost between a boiler installation installed for low pressure, say 150 psig, and one for high pressure, say 600 psig. Hence, if the requirements of a process user could be met with lower pressure boilers, it would be discriminated against in favor of the power units. A detailed study, however, would reveal that there would be no distortion, or that it would be of small order."

Flow characteristics of aerated crushed coal

Charles H. Marks
Peter R. Broadley
John I. Yellott
Bituminous Coal Research, Inc.

"When a bed of fine coal (⅜ inch x 0, with 30 percent or more –50 mesh) is aerated, the behavior of the bed changes from that of a bulk solid to resemble that of a heavy liquid .... In contrast with natural discharge, which takes place in the form of 'funnel flow' aerated coal discharges 'from the bottom first' with the level dropping horizontally like a liquid. Furthermore, the rate of discharge of aerated coal decreases with decrease in bed height as the tank empties. In contrast, natural discharge of a bulk solid from a bin is independent of head and remains constant until the natural angle of repose is approached.

"Although this series of tests was run with only one type of porous medium, some exploratory tests with other media have indicated that its resistance to air flow affects the uniformity of discharge. It is desirable that the resistance of the porous medium be high compared with the bed resistance. In this way air distribution through the coal bed is uniform and is not affected by changes in bed resistance due to segregation or discharge.

"Filling an aerated tank enables the total tank volume to be used because of the negligible angle of repose. Similarly, discharging coal from an aerated tank enables almost complete clearance and, therefore, a very high degree of utilization efficiency. . . ."

Effects of adjacent piping on valve characteristics

G. F. Brockett
Fisher Governor Company

W. J. L. Kennedy
Stone & Webster Engineering Corp.

"It is a regrettable fact that in many instances the care used in specifying control valves in the engineering stages of a project, and the efforts of manufacturers to provide precise valve characteristics and capacities, are partially nullified by poor installation practices. . . . It is believed that [our] basic tests indicate. . . .

"1. Arrangements which amount to a nozzle effect into the body of a single-seated valve will alter its characteristic adversely.
"2. Reduction from line size of inlet block valves will affect characteristic and capacity. Thus, a saving in valve cost will require more pumping horsepower for the same flow rate.
"3. If a block and bypass arrangement must be used around a control valve, the valve is best placed in a straight-through section. Rather tortuous manifolds are sometimes provided for control valves in order to obtain accessibility. The adverse effect on valve characteristic and capacity should be reviewed.
"4. In gas service, the fact that critical pressure drop is available does not insure that the valve capacity will be unaffected by pressure loss in the manifold."

spot news

. . . about industry & power

• Superconductivity—a super problem

One of the least-understood phenomena in physics is superconductivity. One approach that has been made a real contribution to understanding fundamental properties of superconductors is the study of specific heat. Scientists are studying the electronic specific heat of metals because superconductivity phenomena arise from unique behavoir of electrons. Cylinders about one inch in diameter and two inches long are suspended from fine nylon threads inside a chamber maintained at a vacuum of 10^{-10} millimeters of mercury. This chamber is immersed in a bath of liquid helium to obtain temperatures between 1 and 5 degrees above absolute zero. Heat supplied is equivalent to five microwatts for about 30 seconds for making measurements. This is sufficient to raise the temperature of the sample about .05 of a degree. Westinghouse research scientists are now measuring electronic specific heats with an accuracy of about one percent. The data obtained are valuable in improving existing theories of electrical and thermal conduction, magnetism, and crystal dynamics.

• Forecast 600 watts more per person

The electric power industry is expanding faster than the country's manufacturing industries as a whole, according to General Electric Company. Present rate of growth will require generation capacity of an additional 600 watts per person in another 10 years—a total increase of 100 percent, or 100 million kilowatts . . . . The nation's electric utility loads in 1980 will be more than 3½ times as great as 1954 requirements, according to the Federal Power Commission.

• New concept in power frequency measurement

Frequency has been measured by special cross-coil-type mechanisms operating on a position principle without conventional torque springs. A transducer just developed by Westinghouse converts frequency to dc voltage so that a standard dc torque-type volt-meter is used as an indicating or recording receiver. It consists of two resonant-circuit networks in combination with a bridge-type rectifier. Frequency ranges of 58 to 62, 55 to 65, and 50 to 70 cps are standard. Receiver is calibrated in dc volts with a dial marked in cycles. Instrument is simpler, and develops higher torque with more reliable indication and greater accuracy stability than that obtainable with conventional-type instruments.

• September statistics

Production of energy by electric utilities during September totaled 46,334,996,000 kwh, an alltime September high and 17.2 percent over figures for September 1954. It represents a 6.1 percent decrease from totals for August of this year, however . . . . Electric energy production in the United States continued its recordbreaking trend with 524,688,087,000 kwh produced during the year ended September 30—the highest 12-month total on record . . . . Consumption of coal and natural gas by electric utility plants during September set new records. Total of 12,067,319 tons of coal used during September represents an increase of 24.1 percent over consumption in September 1954, but is 4.1 percent below totals for August 1955 . . . . Natural gas used in September amounted to 120,169,916,000 cu ft—1.4 percent over totals for the same month last year, but 9.3 percent below the August 1955 totals.

• New pumps on display

Complete new line of self-priming centrifugal pumps were displayed by Worthington Corporation at the National Chemical Exposition at Philadelphia last month. New pumps, an addition to the company's line of standard end suction centrifugal pumps, are made of Worthite, a super-corrosion-resistant alloy. Major feature is an exclusive recirculation port which enables impeller diameter to be reduced. This broadens the range of hydraulic conditions of the pump, at the same time maintaining priming times and efficiency. An adjustable splitter in the casing compensates for clearance normally provided by a tongue. Pumps are suitable for sump pumping, tank car unloading, and other applications where air- or vapor-handling capacity is required.

• Companies continue combining

Commercial Filters Corporation has acquired the filter divisions of Houdaille-Hershey of Indiana, Inc. and Michiana Products Corporation . . . . U. S. Industries, Inc. has acquired Southern Pipe & Casing Co., manufacturer of welded steel pipe for transmission of water, oil, and gas . . . . Link-Belt Company has announced an exchange of shares with Syntron Company, which will be operated as a subsidiary. Syntron makes an extensive line of feeders and other equipment using pulsating magnetic vibration, as well as electromagnetic and electronic equipment . . . . The Hays Corporation has been reorganized following its annexation of Metrotype Corporation, manufacturer of digital recording equipment and builder of tie-line load control systems for electric utilities. Under the new setup a Hays division and a Metrotype division will be maintained . . . . Conoflow Corporation, manufacturer of panel control elements, will

become an operating subsidiary of the Walworth Company, a leading producer of industrial valves and fittings . . . . Ownership of Continental Foundry & Machine Company properties has been officially transferred to Blaw-Knox Company. East Chicago, Wheeling, and Coraopolis plants will be operated as the Continental Foundry & Machine Division of Blaw-Knox. The Erie plant will be known as the Copes-Vulcan Division of Blaw-Knox . . . . American Radiator & Standard Sanitary Corporation has announced that its wholly owned subsidiary, Kewanee-Ross Corporation, will be dissolved. Two new operating divisions will be formed to continue Kewanee-Ross operations—the Kewanee Boiler division, and the Ross Heat Exchanger division . . . . H. K. Porter Company, Inc. has purchased Henry Disston & Sons, Inc., manufacturers of bar and sheet steel, industrial and domestic tools, and Carlson & Sullivan, Inc., manufacturers of steel rules and measures . . . . Canton Stoker Corporation has purchased the assets of Wagener Steam Pump Company, manufacturers of piston-type steam and power pumps.

• Power essential to automation

An adequate plant electric power distribution system was termed a "keystone" in all programs for increased industrial productivity at the recent automation forum sponsored by Pennsylvania Power & Light Company and

General Electric Company. Discussions ranged from the effects of today's research on the further development of automation processes to new ways to increase production by full use of modern materials handling methods, electronic and electric heating, and automatic controls.

• Metal heat-transfer media

Promising new low-melting alloys that may be applied as liquid metal heat-transfer media have been discovered comprising alloys of bismuth, indium, lead, tin, and thallium. Office of Naval Research says these alloys have freezing points below 210 F. They do not expand on freezing and cooling to room temperature. They have a vapor pressure of less than ½ atmosphere at temperatures up to 1500 F. They did not cause static corrosion of the constructional materials tested.

• Develop new lubricants on several fronts

Naval research laboratory workers have synthesized a new series of almost completely fluorinated esters and ethers for use as lubricants for high-temperature mechanisms. Compounds have good viscosity and oxidation stability, high boiling points, low flammability, and good stability to hydrolysis . . . . An easily applied Teflon film only a few hundredths of an inch thick has also been developed by NRL. It is serviceable from –75 F to 500 F as a combination dry lubricant and corrosion preventive. Over this wide temperature range, Teflon has a coefficient of friction of 0.1 or less . . . . Six new organo-silicone compounds with unusual lubricating and solubility properties have been developed by Linde Air Products Company, a division of Union Carbide and Carbon Corporation. Compounds have excellent release properties, special thermal and viscosity stability, and water repellency. They also have lubrication and antiwear properties that rival those of petroleum oils; they can be used as emulsion breakers for oil products or as emulsifying agents under other conditions.

• Preview maintenance show

Five thousand different pieces of equipment, products and services, valued at $4 million, to help American industry maintain its productive capacity will go on display January 23 at the Plant Maintenance & Engineering Show in Convention Hall, Philadelphia. Running concurrently will be a three-day conference at which 26 aspects of factory upkeep will be discussed. More than 400 companies will exhibit at the show. Exhibition area covers 100,000 sq ft. Exhibits will cover 278 basic types of equipment, products, and services. More than 20,000 executives and engineers are expected to attend.

• Reveal causes of large turbine failures

A combination of residual stresses, low ductility, and thermal stressing is reported to be the most probable cause of fracture of the steam turbine first-stage wheel at Tanners Creek Station of Indiana & Michigan Electric Company. Fracture occurred in the 1800-rpm, low-pressure turbine of No. 1 unit in January 1953. It was a radial break from two holes in the rim down to the junction of the wheel and integral shaft, then around the shaft and outward along a spiral course out to the wheel rim at about 160 degrees from the notch opening.

Flaws present in the forging at the time of manufacture (but which were not identified as flaws with inspection techniques in normal use when the forging was made in 1952) were blamed for the failure of the low-pressure turbine spindle at Commonwealth Edison Company's Ridgeland Station in Chicago last December. The 165,000-kw cross-compound turbine spindle failed during a routine overspeed-trip test after four months' service. Apparently, primary cause of fracture was a combination of hydrogen flakes and high notch sensitivity (susceptibility to brittle failure), occurring together in areas deep within the central mass of the forging.

Exhaustive research tests were carried out to determine probable causes of these failures and to provide future guidance in the inspection of similar large forgings. Complete reports on these tests were presented to engineers attending the recent ASME annual meeting in Chicago.

• New alloy permits smaller rectifiers

Union Switch & Signal Division of Westinghouse Air Brake Company has developed a new rectifier alloy that retains all the advantages of the copper oxide rectifier but permits smaller rectifiers. It offers greater efficiency with better regulation. The new Rectaloy rec-

For more economical operation

Modernize electric distribution systems with SORGEL air-cooled transformers or substations

INCREASE FEEDER CAPACITY AND EFFICIENCY BY TRANSMITTING ELECTRIC POWER AT HIGHER VOLTAGES TO LOAD CENTERS

The most practical type transformers to step down voltages at load centers are SORGEL air-cooled dry-type transformers. They can be installed in almost any convenient place inside of buildings, without fireproof vaults or other enclosures. SORGEL transformers are of the highest quality, and require little or no maintenance. No liquid to check nor replenish; small and compact; easy and convenient to install; economical operation.

Increased efficiency — Because SORGEL transformers can be installed close to load centers, the result is shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Quiet operation — The noise level of SORGEL transformers is well below the established standards. This outstanding feature is appreciated where low noise levels are an important factor. For that reason they are particularly adaptable for indoor installations close to load centers.

Easy installation—Attached wall brackets, with slots for bolts, or floor mounting base. No separate mounting brackets nor junction boxes to make or buy.

A perfect partner for substations — SORGEL transformers can also be incorporated in substations, complete with primary and secondary switchgear. They are procurable with any make of switchgear, and from any substation manufacturer.

Complete Line

¼ Kva to 2500 Kva, single phase.
1 Kva to 3000 Kva, 3-phase, 2-phase and phase changing.
All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, up to 15,000 volts, and any intermediate or special lower voltages.

Tested and approved by Underwriters' Laboratories under the Re-examination Service

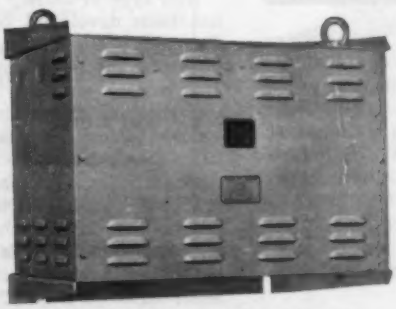
Stock carried by jobbers in the following cities:

New York, N. Y.
Buffalo, N. Y.
Roxbury, Mass.
High Point, N. C.
Raleigh, N. C.
Philadelphia, Pa.
Cincinnati, Ohio
Cleveland, Ohio
Chicago, Ill.
Rock Island, Ill.
Rockford, Ill.
Richmond, Ind.
Louisville, Ky.
Cedar Rapids, Iowa
Davenport, Iowa
Omaha, Neb.
Beaumont, Texas
Los Angeles, Calif.

Consult the classified section of your phone directory or write to factory

Also special transformers and saturable reactors

¼ Kva single phase 480/240 to 240/120 volts



15 to 50 Kva 3-phase. Wall mounting type

100 Kva single phase

SORGEL ELECTRIC CO., 841 West National Avenue, Milwaukee 4, Wis.

40 years' experience in the development, manufacturing and application of transformers

Circle 113 on READ-N-CIRCLE card for more data

spot news

. . . starts on page 67

tifier has the same current rating as former copper-oxide rectifiers, but has a higher voltage rating per cell. This reduces the number of cells in series and lowers forward resistance. It has only about 2/3 the voltage drop of an equivalent-rated selenium rectifier, reducing internal losses and giving higher operating efficiency. Its life expectancy is the same as copper-oxide. It is impervious to moisture and other adverse environment. Maintains stable characteristics even after long periods of idleness.

• Improve incandescent lighting

General Electric Company is now putting into effect developments that will increase light output about 15 percent from higher-wattage incandescent bulbs used in industrial and commercial lighting. Improved lamps are already available in the 750- and 1000-watt sizes, sizes which offer the greatest benefits. Increased light

output has been achieved by improving the tungsten filament through basic design changes, altering the mount structure so that filament is positioned lengthwise in the bulb, and substituting coiled-coil filament for singly coiled ones in lamps of 300 watts and larger. Improved 750-watt bulb will produce an average of 21.6 lumens per watt, as compared with the present 18.9 lumens per watt.

• Successfully test new oil recovery method

Worthington Corporation has successfully completed field test of a new method for oil recovery. Test took place in a shallow field in southeastern Illinois. The field contained highly viscous oil previously considered unrecoverable by any known methods. Bottom temperature of the field (around 50 to 60 F) was too low to allow the heavy oil to run freely or to be driven out of the sandy rock and other natural formations that entrapped it. The idea was to introduce heat to warm up the heavy viscous oil, then bring it to the surface. Special equipment was engineered and built for the job. Hot combustion gases and steam were used as driving agents. Hot air was oxidizer for underground combustion. The sand was virtually emptied of oil and any other carbonaceous matter.

• Utility expansions continue

Detroit Edison is planning to add a 300,000-kw turbogenerator to its St. Clair power plant, increasing the station's capability to 940,000 kw. By late 1959, when the additional unit goes into operation, total capability will be 3,620,000 kw, close to 5 million hp . . . . Ohio Power Company has acquired 500 acres of land along the Ohio River just north of Clarington for the site of a future 1-million-kw steam-electric generating plant. The plant will represent an investment of $125 million.

• Launch radioactive waste survey on Ohio

Ohio River Valley Water Sanitation Commission will measure radioactivity at selected points in the 981-mile length of the river and at the junctions of principal tributaries. This is a preparatory step toward regular monitoring of the river in order that the Commission may keep posted on changes in water quality resulting from the future disposal of radioactive wastes.

• Exclusive system offers more efficient water softening

More efficient water softening per pound of mineral used is the result of an exclusive water collection system in a new line of industrial and commercial water softeners and conditioners introduced by Culligan, Inc. New collection system consists of finely slotted manifolds six inches apart at the bottom of the tank. This allows water to pass through the entire mineral bed. It eliminates chance of one downward channel being created, causing water to bypass the bulk of mineral.

• Develop lightweight battery

New type of battery that gives more output per pound has been developed by American Machine & Foundry Company's engineering laboratory. It will be used for powering special electronic equipment. The silver oxide-zinc battery employs "pile" construction instead of the conventional plate construction. Each cell is an individual battery, which prevents intercell action due to contact between cells through the electrolyte. An individual filler hole for each cell is required. In a dry-charged condition, batteries are capable of self-storage for months. Batteries have been made in sizes of 0.1, 3.0, and 12.0 amp-hr. This larger size yields over 70 amp-hr/lb, and 5 whr/cu in. High efficiency performance is achieved down to 32 F.

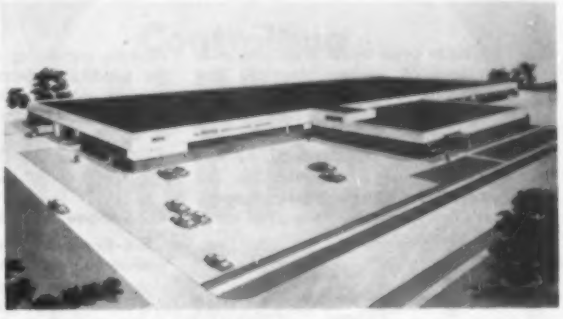
• Big orders in the news

Jones & Laughlin Steel Corporation has announced that both Westinghouse and General Electric will provide

electrical equipment for new units at the Cleveland works. Contemplated blooming and slabbing mill at Cleveland works, for which Westinghouse will provide the electrical equipment, will be powered by two 5000-hp motors. The universal roughing mill will require motors totaling 9500-hp capacity. The four-stand tandem cold reducing mill, powered by General Electric motors, will be rated 22,000 hp . . . . Foster Wheeler Corporation will construct a delayed coking plant; and Kaiser Engineers will erect a calcining plant, utilities, and auxiliary facilities for the American Gilsonite Company near Grand Junction, Colorado . . . . Foster Wheeler has also received an order from Union Electric Company of Missouri covering a dual circulation reheat steam generator for Unit No. 3 at Meramec plant. The steam generator will have a maximum continuous capacity of 1,850,000 lb/hr at 2150 psi and 1010 F with reheat to 1010 F. Fuels will be pulverized bituminous coal and natural gas . . . . The Pelton Water Wheel Company, subsidiary of Baldwin-Lima Hamilton Corporation, will supply the Pacific Gas & Electric Company with two 76,000-hp, vertical shaft, reaction-type hydraulic turbines and auxiliaries for the Poe hydroelectric project . . . . Virginia Electric and Power Company has just retained Stone & Webster Engineering Corporation to design and construct a new 165,000 kw addition to its Bremo power station. Cost of the extension is estimated at $22 million.

• Expansions in the news

Chrysler Corporation plans to spend more than $1 billion in the next five years to expand its plants. It is pushing research on gas turbine engines, nuclear and solar energy, and electronics. A 200-acre site has been selected for its steel stamping plant at Twinsburg, Ohio . . . . International Metal Hose Company has moved to a new plant in Bellevue, Ohio that more than doubles its production capacity of flexible metal tubing . . . . The



Oster Manufacturing Company, manufacturers of pipe and bolt threading machinery and material handling equipment, has moved to its new 105,000 sq-ft plant in Wickliffe, Ohio . . . . Puritan Chemical Company is planning a new $500,000 manufacturing and storage plant addition to its Atlanta, Georgia plant . . . . Koppers Company, Inc. and Brea Chemicals, Inc. are to build a multi-million dollar plant for production of polyethylene on the west coast . . . . Reynolds Metals Company has started building a $5.5 million aluminum extrusion plant about 10 miles from Richmond, Virginia. . . . Joseph T. Ryerson & Son, Inc. national steel distributor, has purchased an 11½-acre site in Charlotte, North Carolina for a new and larger steel service plant.

Pick INSTANTANEOUS HOT WATER HEATERS

ENGINEERED FOR SERVICE

Industries everywhere are replacing outmoded water heaters with Pick Instantaneous Water Heaters. Here are the reasons:

★ Water Is Heated Instantly. Entirely automatic, Pick Heaters operate by steam injection to heat the water in a flash to exact temperature desired and in volume required.

★ Fuel Savings Are Substantial. Steam injection heating is the most efficient method known. There's no waste because water is heated only as used . . . never stored and allowed to cool.

★ No Storage Tanks Required. Compact design of Pick Heaters permits out-of-the-way installation in corners, on walls or overhead. Saves valuable floor space.

★ Exact Temperature Control. Pick heaters can be operated at low or high loads with minimum temperature fluctuation. And it's done quietly.

★ Maintenance Cost Is Low. Pick Heaters can be cleaned in a matter of minutes — worn parts easily replaced.

★ Installation Is Inexpensive. Only ordinary pipe connections are required.

PICK HOT WATER HEATERS . . . Used by

- United States Steel Co.
- Ford Motor Co.
- H. J. Heinz
- Bethlehem Steel Corp.
- Hercules Powder
- Wilson & Co.

and MANY OTHERS

Pick STEAM INJECTION WATER HEATERS

SAVES MONEY FOR ANY INDUSTRY THAT USES HOT WATER!

Write for booklet on how PICK HEATERS cut costs of Hot Water — No Obligation. Write IP-156

PICK MANUFACTURING CO. • WEST BEND, WIS.

Circle 107 on READ-N-CIRCLE card for more data

new bulletins

. . . starts on page 22

of all portable-type units. Contains cutaway sections of carbon dioxide, dry chemical, foam, water, and vaporizing-liquid extinguishers. One section is devoted to fire detection and protection systems for industrial application. An excellent primer on fire protection for management, plant, and industrial operating personnel. Twelve pages. WALTER KIDDE & COMPANY, INC.

430-Moving power systems

How electric feedrail provides moving power systems for safe electrification of your portable tools is described in Bulletin 51. Available in 60, 100, 225, 375, and 500 ampere capacities. Superior to ordinary wiring methods in safety, convenience, and adaptability. Provides a dependable source of power for your portable equipment. Four pages. FEEDRAIL CORPORATION.

431-Saddle clamps repair pipe leaks

Temporary or permanent repair clamps together with gaskets recommended for use with each clamp are discussed in Bulletin 54. Also describes line of special clamps, including method of application, for welding repairs, service outlets, and vented patches. Featuring a clamp for every leak, booklet is valuable reference in solving your maintenance problems. Thirty pages. M. B. SKINNER CO.

432-Remove solids with filters

Sel-Rex filter elements, featuring stainless-steel-mesh annular and leaf-type elements with disposable paper cartridge, are discussed in these bulletins. Portable and stationary units are available with capacities from 250 to 18,000 gph to permit fluid cleaning in 15 minutes or less. Six pages. BART-MESSING CORPORATION.

433-Fast, safe, versatile controls

How to convert unsafe, fatiguing, manually-operated machines into fast, safe power-operation is clearly shown in Bulletin 65. Control boxes, hand switches, foot switches, limit switches, and lockout switches are included in section on control equipment. Another section covers clutch-actuating equipment — including electric solenoids, air cylinders, air valves, and air-lube units. Describes control equipment to handle all equipment installations. Twelve pages. MICRO SWITCH DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR CO.

434-Piston packing data

How to select the proper pump packing for your equipment is described in Bulletin 5503. Engineering data is included on the full range of Pumcup compositions, textures, and types available for specified pressure, temperature, and corrosive conditions. Color-coding for easy identification of the proper composition for many fluids are listed, including gases, acids, and alkalies. Tables of standard sizes from 1- to 20-inch od are also included. Sixteen pages. DARLING VALVE & MANUFACTURING COMPANY.

435-Steel springs tame vibration

Steel springs with unique damping control achieve vibration isolation to a degree previously unobtainable. Helical steel springs, rubber thrust bumpers, nylon dampers, and steel base plates with sway control assemblies are described in Bulletin SS-55. Also contained are load and dimension tables for steady-running and severe-impact conditions. Four pages. T. R. FINN & COMPANY, INC.

436-Quick couplings seal tight

Engineering data and cutaway sections in Bulletin 240 give detail advantages and uses of Snap-tight "H" couplings. Feature cleaner flow lines, longer life, minimum maintenance, and high resistance to surges. Couplings are available in sizes from ¼ to 3 inches. SNAP-TITE, INC.

437-Indicator lights are compact

Oil and dust tightness, omnidirectional beam spread, ruggedness, and adaptability are salient features of indicating lights described in Bulletin L-200. Incandescent and neon glow lamps as well as lettered discs to deliver specific messages are fully described. Lenses are available in six colors and several materials. Four pages. DIALIGHT CORPORATION.

438-Plastic pump manual

Complete operating and performance data, and recommended application tables are presented in Bulletin 55. Selection of proper construction materials result in a pump adaptable for wide use with corrosive solutions and abrasive slurries. Also includes dimensional data and photographs of typical pump installation. VANTON PUMP & EQUIPMENT CORP.

439-Bearing reference manual

Engineering reference manual gives construction, dimensions, capacities, housing, and tolerance fits on complete line of bearings. Contains data for staggered- and journal-type roller bearings, full-type and gage-type needle bearings, cam followers, cam-yoke rollers, and thrust roller bearings. Forty pages. ORANGE ROLLER BEARING CO., INC.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 75.

440-What is dynamic unbalance?

The answer to this question and the answer to how to balance rotating parts weighing from four ounces to eight tons is contained in Bulletin BP-7. Tells how dynamic balancing reduces bearing wear, eliminates noise and vibration, and improves finished product performance and efficiency. Twenty-four pages. BEAR MANUFACTURING CO.

441-Try open-web steel joists

Economical construction using lightweight, strong, versatile, vibration-resistant, and fire-resistant open-web steel

ERNST
SIGHT FLOW INDICATORS
"See What Goes On Inside"
For insertion into pipe
FOR EVERY APPLICATION
BRONZE, IRON, STEEL, STAINLESS STEEL
FIG. 29 Cylinder with Impeller
FIG. 17-28 Cylinder
FIG. 215 Flanged
FIG. E-57 Double Window
FIG. 212 Visibility Welding Neck or Screw
FIG. E-811 Flapper
FIG. E-1810 Rotating Wheel Type
All sizes up to 6" Send for Catalog
ERNST WATER COLUMN & GAGE CO.
LIVINGSTON, N. J.
Circle 118 on READ-N-CIRCLE card

joists is described in Bulletin 70-4. Tables show total safe load in pounds per square foot for various joist spacings. Data on installation, accessories, physical properties, and linear-load tables based on various configurations are included. Twenty pages. JOSEPH T. RYERSON & SON, INC.

442-Slip-clutch prevents overload

Self-contained unit that is easily installed between driving and driven mechanism for overload protection is described in this bulletin. Tork-o-stat automatically resets when overload is removed. May be installed on in-line, direct, or take-off drives. Available for applications from 10- to 60-inch pounds torque rating. Supplied in a variety of bore sizes. MACHINE ACCESSORIES, INC.

443-How to care for pumps

How to install and take care of power pumps is visually demonstrated in Bulletin G-2198. Explains details of foundations, suction conditions, piping support, cleaning, alignment, lubrication, and testing. Also includes maintenance information on initial and replacement packing, packing adjustment, common types of pump valves, and tips on trouble-shooting. A helpful guide on power pumps for engineers and operating men concerned with pump installation and operation. Twenty pages. WORTHINGTON CORPORATION.

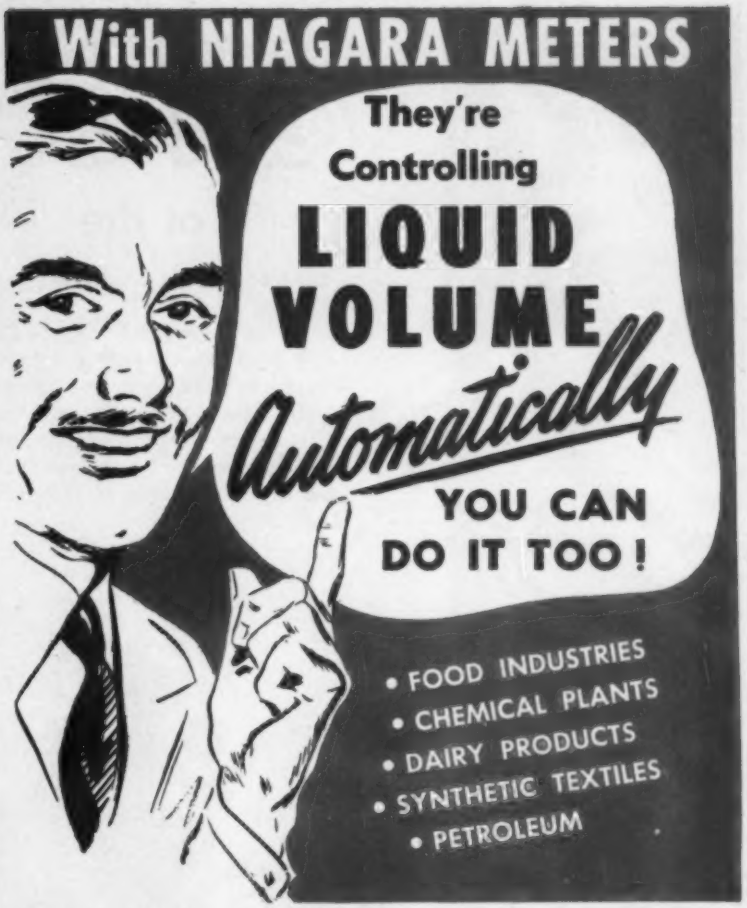
444-Heat-transfer selection guide

Engineering data, dimensional drawings, and capacities for easy selection of the more commonly used types of heat-transfer equipment are contained in Bulletin 31. Additional data is also included for booster heaters, instantaneous water heaters, condensate coolers, and converters. Recommendations for installations in industrial, chemical, and process industries are given. Twelve pages. BUXTON MANUFACTURING CO.

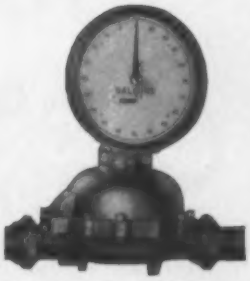
445-Casters can corral cash

Casters may be the answer to moving materials in crowded areas in your plant. Bulletin 155 gives information on the complete line of casters including steel, semipneumatic, and pneumatic wheels. Wheel size, load capacity, overall height, and approximate weight of a variety of casters is included. Recommendations for use of steel and pneumatic wheels with consideration for sparking and floor condition are also included. Thirty-six pages. PHOENIX CASTER CO., INC.

(more bulletins on page 86)



Imagine the time and guesswork you can save by measuring liquid volumes automatically. Just set the hand of the NIAGARA Electri-Contact METER at the volume desired and turn on the flow of liquid.



SET IT — FORGET IT

It will turn off automatically. NIAGARA METERS enable your men to handle more work.

Practically every type of industry is using and acclaiming the accuracy of NIAGARA METERS. They precisely measure liquid volumes from one to one thousand gallons a minute!

There's a NIAGARA METER for nearly every type of liquid including most chemicals. Investigate the advantages of NIAGARA METERS.

Write today for full details.

BUFFALO METER CO.

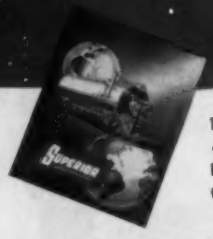
2892 MAIN STREET • BUFFALO, NEW YORK

Circle 122 on READ-N-CIRCLE card for more data

The following list is typical of the process industries served by

SUPERIOR STEAM GENERATORS

ALCOHOL
ARTIFICIAL LEATHER
CEMENT
CERAMICS
CHEMICALS
COAL TAR PRODUCTS
ELECTRODES
FOOD PRODUCTS
GLASS
LINOLEUM
PAINT AND VARNISH
PETROLEUM
PROVISIONS
PULP and PAPER
RUBBER
SOAP
SUGAR REFINING
VEGETABLE and MINERAL OILS
WATER GAS
WOOD CHEMICALS



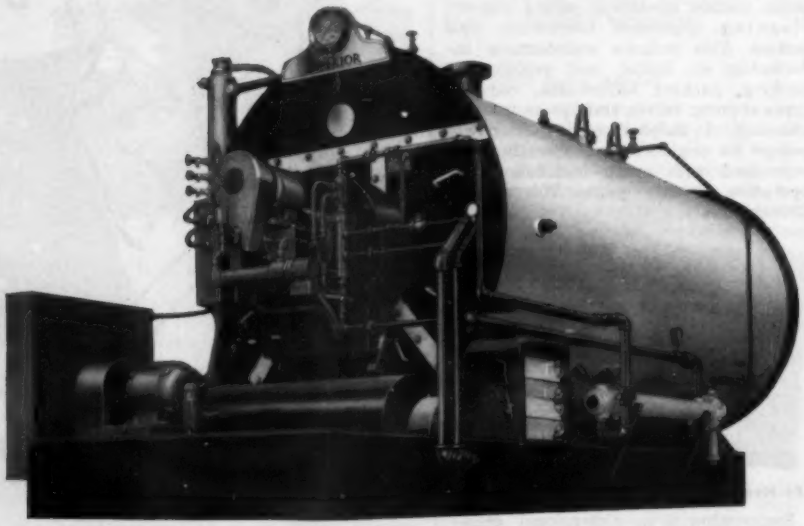
18 sizes from 20 to 600 b.h.p. and for pressures to 250 p.s.i. For complete details write today for Catalog 702

STEAM

at the POINT OF USE

cuts costs for process industries

To provide high quality process steam for widely separated operations, many processing plants are installing completely packaged Superior Steam Generators at, or close to the point where steam is used. These highly efficient and compact units may be set up on any floor capable of supporting their weight, connected to service supply and fuel lines, and put into operation within 24 hours of delivery.



Put a *PACKAGED PLANT* in your picture

Avoid the trouble and expense of inefficient long steam lines by installing completely packaged Superior Steam Generators at the point of steam consumption. Superior Steam Generators are fully automatic, burning oil, gas, or both in combination; and are guaranteed to operate at thermal efficiencies in excess of 80%.

for performance you can ***BANK*** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
STEAM GENERATORS

Circle 104 on READ-N-CIRCLE card for more data

Use a READ-N-CIRCLE card for FREE new product information, handbooks, bulletins, literature for your data file.

READ

this issue of Industry & Power

and

CIRCLE

the key numbers on the adjoining cards corresponding to the advertisements, new products, and literature items that interest you.

Drop the READ-N-CIRCLE card in the mail. No stamp is needed.

INDUSTRY & POWER'S Reader Service Department will immediately forward your requests to the manufacturers, who will send directly to you the information you request.

handy guide

. . . to advertised products

Air cleaning equipment

Blanketed by dust?
Read page 17 and circle number 100

PRAT-DANIEL CORPORATION. Industrial dusts and flyash can be controlled with engineered P-D Collector Systems. Reprint 102 tells how.

Boilers and boiler accessories

Fast hot water at low cost
Read page 92 and circle number 101

THE JOHNSON CORPORATION. Live steam under full pressure is the secret of the Johnson "Instant" Heater. Result—faster, more efficient heat transfer.

Safe boiler control
Read page 29 and circle number 102

MAGNETROL, INC. Control boiler water level with exclusive Magnetrol three-switch design. Easy maintenance, long life. Mail coupon for free data.

READ-N-CIRCLE Card for FREE information

Your name_____ Title_____

Company name_____

Company address_____

City_____ Zone_____ State_____

Please give company name above. If you wish delivery of free information at home, also fill in below.

Home address_____

City_____ Zone_____ State_____

100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124
125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149
150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174

400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424
425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449
450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474
475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499
500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524
525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549
550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574
575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599
600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624
625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649

700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724
725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749

INDUSTRY & POWER January, 1956 Card void after May 1, 1956

READ-N-CIRCLE Card for FREE information

Your name_____ Title_____

Company name_____

Company address_____

City_____ Zone_____ State_____

Please give company name above. If you wish delivery of free information at home, also fill in below.

Home address_____

City_____ Zone_____ State_____

100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124
125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149
150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174

400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424
425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449
450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474
475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499
500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524
525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549
550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574
575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599
600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624
625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649

700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724
725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749

INDUSTRY & POWER January, 1956 Card void after May 1, 1956

Dependable remote reading
Read page 31 and circle number 103
THE RELIANCE GAUGE COLUMN COMPANY. Eye-Hye water level gage offers simple hydrostatic operation. Factory calibrated, no mechanical working parts. Cannot be tampered with! Bulletin CO gives details.

Steam where you need it
Read page 74 and circle number 104
SUPERIOR COMBUSTION INDUSTRIES INC. Completely packaged Superior Steam Generators can be installed at the point of steam consumption. Can be installed and operating within 24 hours. Catalog 702 gives sizes and ranges.

'Package' boiler blowoff valves
Read page 34 and circle number 105
YARNALL-WARING COMPANY. Package boilers are now being offered complete with blowoff valve. Preferred Utilities Mfg. Corp. and other Boiler manufacturers furnish Yarway. Get complete data in Bulletin B-426.

Boiler price vs steam cost
Read page 19 and circle number 106
AMES IRON WORKS. Amesteam Generators are built up to a standard, not down to a price. Join the Ames customers and get true economy in low-cost steam. Send coupon for further information.

Hot water fast
Read page 71 and circle number 107
PICK MANUFACTURING CO. Pick instantaneous hot water heaters are engineered for service. Write for booklet on how Pick heaters cut cost of hot water.

Building construction, materials

Fabrication specialties
Read page 4 and circle number 108
THE KIRK & BLUM MANUFACTURING CO. Kirk & Blum designs, fabricates, and installs complete dust and fume control systems. Let them study your plant and recommend solution for dust and fume problems.

Compressed air supply

Lower compressed air cost
Read page 5 and circle number 109
NIAGARA BLOWER COMPANY. Cooler, dryer air is obtained with the Niagara Aero aftercooler. Direct saving in cooling water cost can pay out initial investment in less than two years. Write for Bulletin 130.

Corrosion control

Single coat protects for years
Read page 25 and circle number 110
SUBOX, INC. Get five to eight years' protection from a single coat of Subox. Write for a free copy of "Corrosion Control of Electrical Structures and Equipment."

Electrical distribution

Protect your motors
Read page 26-27 and circle number 111
BUSSMANN MFG. CO. Prepare for electrical hazards. Don't risk losses. Install Fusetron, the 10-point protection fuse. Copies of Bulletins HCS and FIS are an "ounce of prevention."

Switchgear value
Read page 11 and circle number 112
I-T-E CIRCUIT BREAKER COMPANY. Switchgear Division. More for your money in I-T-E switchgear. Quality design plus attention to detail means long wear and trouble-free service. Information on request.

Modernization pays for itself
Read page 69 and circle number 113
SORGEL ELECTRIC CO. For economical operation, modernize electrical distribution systems with Sorgel air-cooled transformers or substations. Request money-saving details from our factory.

FIRST CLASS
PERMIT No. 19
(Sec. 34.9, P.L.&R.)
ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ POSTAGE WILL BE PAID BY

INDUSTRY & POWER

COMMERCIAL BANK BLDG.

ST. JOSEPH, MICH.

FIRST CLASS
PERMIT No. 19
(Sec. 34.9, P.L.&R.)
ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ POSTAGE WILL BE PAID BY

INDUSTRY & POWER

COMMERCIAL BANK BLDG.

ST. JOSEPH, MICH.

handy guide

. . . starts on page 75

Electrical utilization

Fast, economical electric heat
Read page 6 and circle number 114
EDWIN L. WIEGAND COMPANY. Heat liquids, air or gases, platens, dies, molds. Use anywhere you need easy-to-control heat up to 1100 F. Write for your copy of Catalog 50.

Fuels and firing equipment

Fuels do make a difference
Read page 21 and circle number 115
CHESAPEAKE AND OHIO RAILWAY. There's a lot more to buying coal than considering the cost per ton. Want to solve your particular fuel requirements? C&O will be glad to help.

Complete burner requirements
Read page 88 and circle number 116
THE ENGINEER COMPANY. Enco burners for oil, gas, or tar offer complete flexibility for all plant requirements. Bulletin OB-53.

Why not burn your refuse?
Read page 14-15 and circle number 117
DETROIT STOKER COMPANY. Obtain low-cost steam from refuse fuels. Use Roto-Stokers. Rapid burning, uniform fuel distribution is assured with time-tested equipment.

Instruments and controls

Sight flow indicators
Read page 72 and circle number 118
ERNST WATER COLUMN & GAGE CO. Order high-pressure gage glasses from Ernst. Made in various lengths and diameters. Send for catalog.

Electric eye inspects material
Read page 80 and circle number 119
ESS INSTRUMENT COMPANY. "Little David" miniature electric eyes count, monitor, control, and inspect objects in transit. The simple answer to tough measuring problems.

Police your flow traffic
Read page 89 and circle number 120
HENSZEY CO. Flow meter sounds alarm, lights indicator, or activates a valve as well as measuring flow. Details available in bulletin.

Prevent overheating
Read page 81 and circle number 121
THE POWERS REGULATOR CO. Control flow of steam, water, or gas with Powers temperature regulator. Made for many industrial processes. Bulletin 329 gives data on valve type and size selection for good contro'.

Control liquids automatically
Read page 73 and circle number 122
BUFFALO METER CO. Set it — forget it. Niagara Meters automatically turn off flow when preset volume is reached. Precisely measure many liquids from 1 to 1000 gpm. Write for details.

Lubrication

Extra hours of peak performance
Read page 3 and circle number 123
SINCLAIR REFINING CO. Sinclair RUBILENE for better diesel performance prevents excessive wear of moving parts—pays off in lower maintenance costs. Write for further information.

Turbine protection
Read page 94 and circle number 124
THE TEXAS COMPANY. Texaco Regal Oils afford extra protection against sludge, rust, and foam — assure clean turbine systems. Texaco lubrication engineers can help you achieve greater power plant efficiency.

Maintenance items

Support 690 pounds for 10 cents
Read page 79 and circle number 125
SMOOTH-ON MANUFACTURING CO. Smooth-On can do it. It has hundreds of uses for quick, low cost, emergency repairs. Free 48-page repair handbook. Shows repairs in detail. Send to Dept. 19.

Planned maintenance
Read page 87 and circle number 126
GRAPHIC SYSTEMS. Broadmaster Visual Control gives graphic picture of your operations. Systemize your maintenance visually. Save time and money—prevent errors. Booklet P-10 tells how.

Precise tube expansion
Read page 93 and circle number 127
THOMAS C. WILSON, INC. Tube expansion is our business. Check exclusive features of the Wilson Torq-Air-Matic, a new air-driven tube expander. Bulletin 55 gives details.

Refractory and insulation

New soot blower packing
Read page 23 and circle number 128
JOHNS-MANVILLE. Specially designed packing will withstand high temrperatures and pressures of modern soot blowers. Cumpac 236 will save you time and trouble, reduce repacking. Ask for Folder PK-100A.

Clean, dry air is guaranteed
Read page 20 and circle number 129
JAS. A. MURPHY & Co. This trap eliminates all water and oil from your compressed air installation. Entirely automatic. Requires no supervision. Write for literature.

Valves and regulators

Positive closure, low maintenance
Read page 9 and circle number 130
THE CHAPMAN VALVE MANUFACTURING COMPANY. Rigid specifications are maintained in Chapman's steel valves. This assures smooth and dependable service. Catalog 20 describes the Chapman line of gates, globes, and checks.

Quality valves
Read page 92 and circle number 131
REPUBLIC MANUFACTURING CO. Complete line of plug, globe, needle, and check valves is available at Republic. Send for catalog.

Fast, tight shutoff
Read page 2 and circle number 132
LESLIE CO. Shutoff valve is equally efficient with steam or air — designed for flexibility of service. Send for Bulletin 5309 describing operating valves.

Vibration and noise control

New publication
Read page 87 and circle number 138
AMERICAN INSTITUTE OF PHYSICS. Devoted exclusively to noise in industry and cities. Send for sample copy of *Noise Control*.

Water supply and treatment

Effective water conditioning
Read page 7 and circle number 133
W. H. & L. D. BETZ. Completely integrated engineering on all water problems is offered by Betz. From research to installation, the Betz water specialists are at work for you.

Effective economical boiler water
Read page 83 and circle number 134
The BIRD-ARCHER COMPANY. Combat wet steam problems with Concentrol. Eliminates costly pretreatment. Write for information.

Demineralizers built
Read page 91 and circle number 135
HUNGERFORD & TERRY, INC. A complete line of water conditioning systems is available from H&T. All sizes, all capacities, manual or automatic. Send for bulletin.

No more water supply guesswork
Read page 85 and circle number 136
RANNEY METHOD WATER SUPPLIES, INC. Use the modern scientific method of getting adequate water. Write Dept. IP-2 for Ranney Method description.

Consult experts on water problems
Read page 13 and circle number 137
COCHRANE CORPORATION. Over half-a-century in the field of water conditioning. This complete service provides a single responsibility for continuous satisfaction of every installation.

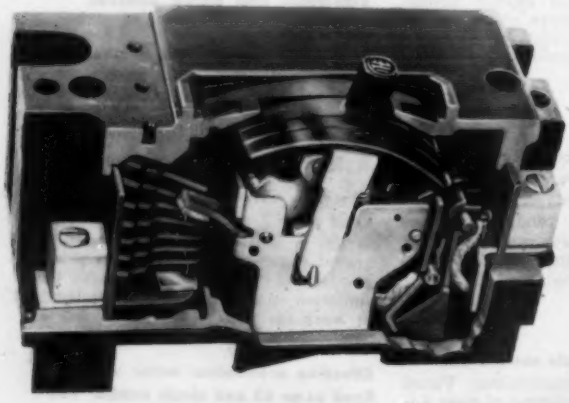
ideas in action

. . . starts on page 28

made by manual switching with no effect upon load. Two oil-to-air radiator-type coolers are used to cool lubricating oil for the gas-turbine power plant. One cooler is used for normal operation, the other is available as a standby. Cooling air is supplied by motor-driven axiflow fans automatically controlled by a thermostatic switch in the lube-oil piping. Gas-turbine power plants can operate without cooling water, permitting wide choice of location.

Higher ratings for small breakers

Use of Gibsiloy electrical contacts in the new I-T-E "E" frame circuit breaker makes possible higher ratings for small breakers. "E" frame design now provides ratings up to 100 amperes at 250 volts ac in a more compact breaker than was previously required. This makes possible smaller 100-ampere, 250-volt panelboards. Big factor in the



success of this development is the adoption of silver-tungsten electrical contacts. Contacts are small and economical without sacrificing qualities necessary for dependable performance during constant duty. The silver-tungsten moving and stationary contacts are made by the Gibson Electric Company.

Fireproof roof slashes insurance rates 50 percent

Insurance rates for new industrial buildings are being slashed as much as 50 percent with a new type of fireproof construction. This construction uses vermiculite, a mica-like mineral mixed with cement, which is poured monolithically over metal decking. Vermiculite provides excellent insulation, as well as being a fire-protective coating. Lower overall building costs result. In a recent Underwriters' Laboratories test, this type of construction was given a one-hour, 30-minute rating. As an example of the insurance savings available to industry, a Chicago shopping center with 173,000 sq ft of roof will realize $35,700 savings during the next 10 years. An Indiana seed warehouse saves $2000 yearly in insurance.

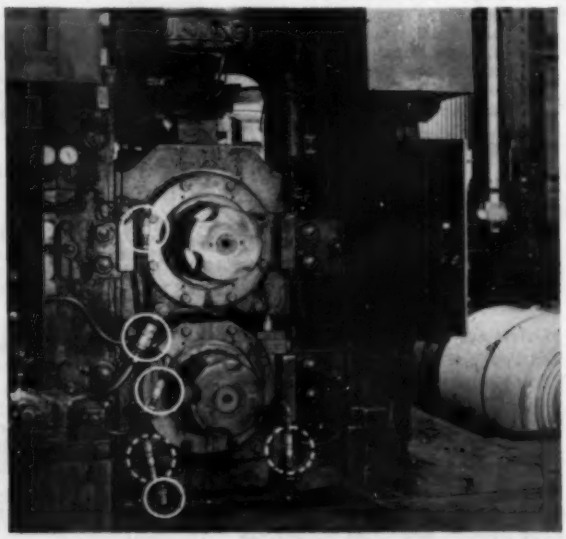
Largest single-unit demineralizer

Fully automatic demineralization plant has been designed and built by the Belco Division of Bogue Electric Manufacturing Company for the Monsanto Chemical Company plant at Texas City, Texas. It will supply the equivalent of triple-distilled water to the boilers at Monsanto's power plant at a rate of one-half million pounds per hour. The control panel, 7 feet 9 inches high and 33 feet long, is designed for accessibility and easy inspection. It shows the flow pattern at a glance in any portion of the demineralization plant by means of a lighted flow diagram made up of flat plastic strips, each colored for a particular type of flow. Panel front is covered with Formica to simplify cleaning. Overhead canopy provides ample lighting.

Hose coupling reduces downtime in mill

Crucible Steel Co., of Midland, Pennsylvania, has found that it can cut profit-eating downtime required for changing mill rolls to a minimum with the aid of a unique hose coupling manufactured by Titeflex, Inc. A single-stand reducing mill turns out steel sheet at a maximum speed of 800 ft/min, so downtime for the roll change means a costly production loss.

Where stainless steel is rolled to a mirror finish, work rolls have to be changed as soon as the roll surface shows the slightest deterioration due to wear. Crucible found that work rolls in its 56-inch four-high reducing mill had to be changed about twice every eight-hour shift. Although replacement rolls are kept in reserve alongside each mill, and crews become expert at replacing



the rolls quickly, one difficulty often bogs down the whole operation—coupling and uncoupling of fluid lines connected to the rolls. These fluid lines connect to the mill rolls to provide a heavy flow of lubricant to cool and to lubricate the large bearings of the backup rolls and to feed high-pressure hydraulic fluid into hydraulic lifting jacks.

Fluid lines were originally connected to roll blocks by unions. These had to be disconnected every time a roll was removed. Cramped space aggravated this bottleneck. In fact, connecting and disconnecting the unions

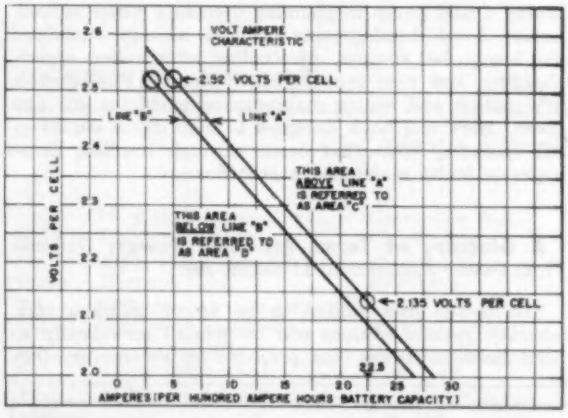
accounted for more downtime than the entire period (about 20 minutes) required for the rest of the roll-changing operation.

Quick-Seal couplings were installed with built-in check valves that snap closed to automatically close up both ends of each line the instant the coupling is opened. These couplings have reduced downtime to a minimum. Downtime is now a known factor that can be scheduled, not a variable depending on a man's handiness with a wrench. The couplings have been in use for about five years with practically no maintenance.

Simple check for battery charging equipment

Checking the adjustment of lead-acid battery charging equipment has been made simpler by a method developed at Gould-National Batteries, Inc. Line "A" is drawn through a point on the graph at 2.52 volts (per cell) and 5 amperes (per 100 amp-hr) and a point represented by 2.135 volts (per cell) and 22.5 amperes (per 100 amp-hr). Line "B" is drawn parallel to line "A" through a point on the graph at 2.52 volts (per cell) and 3 amperes (per 100 amp-hr). Battery voltage and ampere readings are checked and recorded frequently during the charging period.

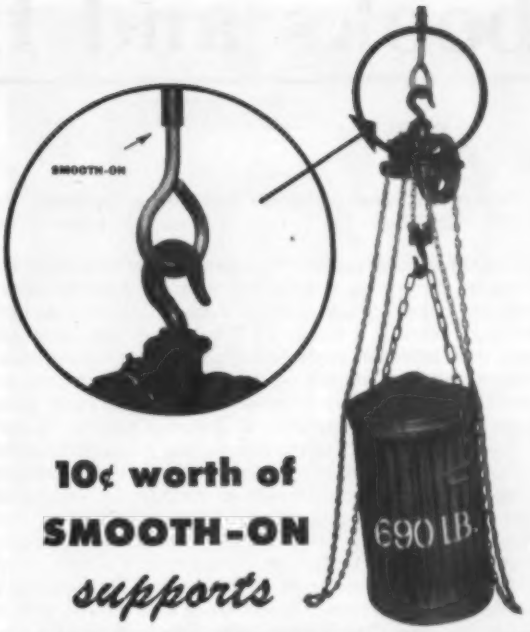
To check your own equipment, plot these readings on the graph drawn for your own battery. If the points fall on the graph above line "A" in area "C," charging could be improved by adjusting the charging equipment. This shows that charging is being completed too quickly with excessive gassing and temperature increase. If charging



is continued without adjustment, battery life will be decreased. If the points fall in the area between lines "A" and "B," the equipment is well adjusted. If the points fall below line "B" in area "D," both starting and finish rates of charge are safe. However, charging may require more than eight hours.

This basic graph can be converted to check charging equipment for any motive-power battery by multiplying the voltage scale by the number of cells in your battery, and the ampere scale by the ratio of rated capacity of the battery to 100 ampere-hours.

Test should be carried out by experienced personnel, with a topnotch battery, with mechanically sound charging equipment, and with equipment that has been warmed up thoroughly before starting the test.



10¢ worth of SMOOTH-ON *supports* 690 POUNDS!

Smooth-On, with its expanding action and iron-hard set, made the joint which supports the load shown —an ash can loaded with iron filings to a total weight of 690 pounds. Only Smooth-On No. 1 is holding that eyebolt in that pipe!

Hundreds of Uses This principle can be used in dozens of ways around both plant and home. By expanding hard and tight within a repair, Smooth-On IRON Cement stops leaks, fills holes and seams in any metal, patches boilers, repairs water jackets and radiators, corrects wobbly bolts and screws, plugs tanks, holds loose parts tight — in fact, does all kinds of things where that combination of strength and expansion can be used. Smooth-On IRON Cement never tires, or softens from age. Years after a repair is made the Smooth-On will be found harder, tighter, stronger.

Keep Smooth-On No. 1 on hand for that emergency repair. It does not deteriorate. Whenever you need it, just mix and fix. It sets in half an hour, hardens to Rockwell R-70 in 24 hours. And of course there is Smooth-On No. 2, a slower-setting IRON Cement but with the same dependable properties.

SO402

FREE Repair Handbook

New, completely revised 48-page illustrated handbook, shows in detail how to make all the repairs referred to here plus dozens of others. Get a copy from your supply house or write us. Sent postpaid.

SMOOTH-ON MANUFACTURING CO.
Dept. 19, 572 Communipaw Avenue, Jersey City 4, N. J.

SMOOTH-ON
THE IRON CEMENT OF MANY USES
Circle 125 on READ-N-CIRCLE card for more data

books and films

. . . for industry & power

Design of Heating and Ventilating Systems, by F. W. Hutchinson; The Industrial Press; 308 pages; $7.00.

This book offers a ready means of solving complex formulas frequently met in this field. It deals primarily with engineering design, rather than equipment selection, although there is a wealth of information here that will help with selection problems. Full page graphical solutions of the most important equations in each chapter are provided to help save engineering time—in some cases they will entirely eliminate calculations. Another feature is the inclusion of complete design data for systems using partial solar heating through the use of large windows. Chapters on load determination include discussions of transmission losses, intermittent heating, ventilation, and humidification loads, and losses from ducts and pipes. A chapter on air distribution offers a means of evaluating friction loss in all elements of the system. Typography is clear and easy to read. Charts are drawn with a view to accuracy rather than artistic value. The book should provide worthwhile reading to any plant engineer who is interested in selection or modification of heating and ventilating systems.

Architectural Engineering, by the editors of *Architectural Record;* F. W. Dodge Corporation; 500 pages; $11.50.

Here is a detailed, up-to-date source of specific information on new concepts, methods, materials, and applications for all plant engineers interested in construction and maintenance work. The reader will find many cost-cutting suggestions, new uses for old and new materials, and new structural systems in this book. It is divided into six extensive sections: the building shell, environmental control, utilities, site planning, materials, and special problems. Many newly developed areas of the subject are explored, including heat pumps, concrete prefabrication, solar heating, lightweight aggregates, structural plywood, and plastics. Four chapters are devoted to planning for atomic energy. The book has modern typography and is well illustrated with a profusion of clear diagrams and photographs. This book will be a stimulus to any engineer who is responsible for building construction and maintenance.

Wood Columns, Design and Load Information; National Lumber Manufacturers Assn; 52 pages; 50¢.

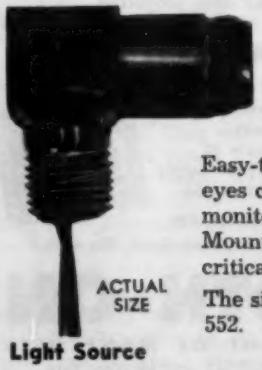
New and simplified procedure for figuring how much weight can be supported safely by solid and laminated wood columns is presented in this publication. It contains extensive tables of allowable loads for various sizes and lengths of wood columns. Includes detailed instructions on how to apply the information. The load-bearing capacity-figuring method considers more fully than the old formulas the unique ability of wood to support loads in excess of normal design loads for short periods.

Diesel Operator's Guide, by C. Morgan Jones; McGraw-Hill Book Company; 389 pages; $6.50.

This is a practical book to meet the needs of all diesel engine operators and maintenance men. It tells how to recognize engine trouble symptoms, how to diagnose their causes, how to remedy the defects, and how to prevent their recurrence. The whole field is covered, from timing a fuel pump to planning a cooling water system. Latest diesel developments covered include duel-fired and heavy-fuel engines, intercooling, aftercooling, supercharging, and new types of fuel pumps. Fuel-storage information and engine maintenance schedules are also given. Here is a book designed to help diesel engineers cut operating costs that occur through needless stoppages or faulty maintenance procedures.

A Glossary of Terms for Fluid Power; National Fluid Power Association; 11 pages; 20¢.

This is the first edition to be issued under a plan whereby revised editions will be printed periodically as need develops. It has been prepared by a committee that


ACTUAL SIZE
Light Source

New LOW-COST Way to COUNT, MONITOR, CONTROL

"Little David" Miniature Electric Eyes"

Easy-to-install, low in cost — these "Little David" miniature electric eyes can help you solve many problems, where you need to count, monitor, control, inspect, protect, or position objects in transit. Mount on ¼" pipe fittings. Light source (left) throws beam across critical gap to photo-unit (right).

The simple answer to tough measuring problems. Write for Bulletin 552.

Ess Instrument Co., Box 1491, Bergenfield 10, N. J.

ACTUAL SIZE
Photounit

Circle 119 on READ-N-CIRCLE card for more data

represents a cross section of the industry. It is worthy of library space even if you have little interest in fluid power right now.

FILMS

The Operation and Application of Turbodryers; Wyssmont Company, Inc.

This is a 12-minute, 16-mm, sound color movie that explains drying in general, with emphasis on design, operation, and uses of vertical Turbodryers, particularly on drying heat- or oxygen-sensitive materials.

How to Cut Electrical Maintenance Costs; SAFE-T-SEAL Division of M B Aircraft Services, Inc.

This 15-minute 16-mm sound color film tells how to drastically reduce electrical maintenance costs. It shows many field applications where SAFE-T-SEAL, an electrical insulation impregnator, has been used to solve breakdown problems caused by moisture, salt spray, and extreme temperature changes. It also shows the processes used to rewind electric motors.

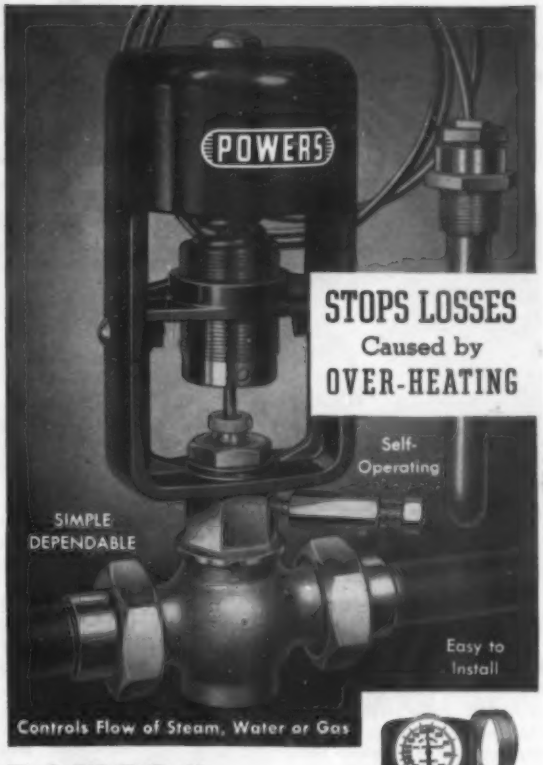
This Is Automation; Apparatus Sales Division; General Electric Company.

This 30-minute color film, latest in a series of G. E. "More Power to America" productions, traces evolution of automation since its inception in the early 19th century. It shows how middle- and small-size industries can improve their operations by adopting the techniques that comprise automation.

coming events

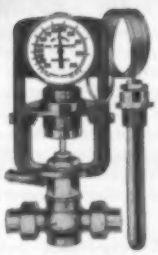
. . . for industry & power

Jan. 23-26	Plant Maintenance & Engineering Show	Convention Hall Philadelphia
Jan. 30-Feb. 3	AIEE Winter General Meeting	Hotel Statler New York
Feb. 6-9	Fifth Annual Industrial Ventilation Conference	Kellogg Center Michigan State U.
Feb. 9	ISA Annual Mid-winter Conference	Hotel Statler New York
Mar. 18-21	ASME Spring Meeting	Multnomah Hotel Portland
Mar. 21-23	American Power Conference	Hotel Sherman Chicago
Mar. 26-27	ASME Instruments and Regulators Conference	Princeton Univ. Princeton, N. J.
Apr. 1-5	ASME Oil, Gas, and Power Conference	Jung Hotel New Orleans
Apr. 2-4	AIEE Southwest District Meeting	Dallas
Apr. 5-7	Eighth Biennial Electric Industry Show	Shrine Hall Los Angeles
Apr. 16-17	ASME Gas Turbine Power Division Conference	Hotel Statler Washington, D. C.
Apr. 16-18	AIEE Great Lakes District Meeting	Fort Wayne Indiana
May 2-4	AIEE Northeast District Meeting	Rochester, N.Y.



POWERS No. 11
TEMPERATURE REGULATOR

Simplest, reliable control made for: Water Heaters, many Industrial Processes, Heat Exchangers, Air Compressors, Diesel and Gas Engines, Fuel and Crude Oil Heaters.


Temperature Indicating Regulator

Features that give
BETTER CONTROL

- **Powers bellows has 50% more power** than used in the majority of regulators. The heart of a self operating regulator is its bellows. Powers with its 50% greater effective area gives better control and its durable 2 ply bellows outlasts ordinary single ply bellows.
- **Valve stem lubricator** with silicone grease aids easy movement of highly polished stainless steel valve stem and reduces drying out of packing.
- **BETTER CONTROL** results from Powers powerful bellows and minimum of valve stem friction.

60°F. temperature ranges available with accuracy of ±1°F. on some processes and 2 to 3°F. on others.

Rugged bronze valve bodies with bronze union connections, for single and double seat valves thru 2", reduce installation time and labor. Larger sizes have flanged iron body valves.

Powers Nationwide Service and 24 Hour Delivery in the U.S.A. are important time and money saving advantages.

Right type and size of valve is important for good control. May we help you make the right selection? Benefit from POWERS more than 60 years experience in self-operating regulators. *Write for Bulletin 329.* (e37)

THE POWERS REGULATOR CO.
Skokie, Ill., • Offices in 60 Cities • See Your Phone Book

Over 60 Years of Automatic Temperature and Humidity Control

Circle 121 on READ-N-CIRCLE card for more data

names make news

Mrs. Merrill

Making the news again is **Mrs. Dot Merrill**, engineer, owner, and manager of **Merrill and Company**. She is a member of ASME and a former executive council chairman of the Gas, Fuels, and Combustion Section of Western Society of Engineers. Merrill and Company has been appointed to represent Condenser Service & Engineering Company, well-known designers and manufacturers of tubular heat-exchange equipment, steam surface condensers, feedwater heaters, boilers, and boiler accessories.

Crouse-Hinds has named **Albert H. Clarke**, former commercial vice president, to the position of vice president in charge of engineering. Clarke succeeds **Carl H. Bissell**, who is retiring after 53 years of company service. Both men are well known in the electrical manufacturing industry.

Beckman Instruments, Inc. has appointed **Donald C. Duncan** as manager of the Berkeley Division. Duncan holds degrees in both electrical and mechanical engineering. He was formerly industrial control test engineer for General Electric. Duncan also served as an electrical engineer with the US Navy Bureau of Ships in Washington, D.C. from 1941 to 1945.

Duncan

American Standards Association has selected two men to receive gold medals. **Harold S. Osborne** will receive the Howard Coonley Medal for service in advancing the national economy through voluntary standards. **James G. Morrow**, Steel Company of Canada, Ltd., will receive the Standards Medal, awarded annually for leadership in the development and application of voluntary standards.

Alco Products, Inc. has named **Everett N. Sieder** marketing manager of thermal products. Sieder holds numerous patents for heat exchangers and refining processes. He was formerly manager of thermal product planning.

American Institute of Consulting Engineers has selected **Benjamin F. Fairless** (chairman of the Executive Advisory Committee, US Steel Corporation), as 1955 recipient of the Award of Merit. Previous recipients of this award are Clarence Decatur Howe, 1952; Dr. Vannevar Bush, 1953; and Herbert Hoover, 1954.

Fairbanks, Morse & Co. has elected **Robert D. Brown** as assistant secretary and assistant treasurer of the corporation. Brown was formerly associated with Richardson Company and International Harvester Company.

National Safety Council has elected **Earl H. Houck** general chairman of the Metals Section. Houck is supervisor of safety and welfare at the Aliquippa Works, Jones & Laughlin Steel Corporation. The election was held during the 43rd National Safety Congress in Chicago.

Hewitt-Robins Inc. has appointed **Donald V. Sarbach** to the newly created position of research director. Sarbach was formerly technical manager for development of new industrial products with B. F. Goodrich Company. He holds 30 patents on various rubber and chemical products and processes.

De Laval Steam Turbine Co. has appointed **John D. Horth** assistant manager of the compressor sales department. Horth joined De Laval in 1947 and has held previous managerial sales positions in the company.

Cutler-Hammer, Inc. announces executive promotions. **G. S. Crane**, president and chief executive officer of the company, was elected chairman of the board of directors. He succeeds H. F. Vogt, who retires after 56 years of company service. **Philip Ryan**, executive vice president and vice president in charge of manufacturing and development engineering, was elected president and chief executive officer to succeed Crane.

Trion, Inc. has elected **Norbert F. Eichelsbacher** to vice president in charge of manufacturing. Eichelsbacher has been associated with the company as treasurer since its inception in 1947.

Borg-Warner Corp. has named **Joseph M. Gartner** administrative assistant to the president. Gartner is a licensed professional engineer, a licensed patent attorney, and inventor of the "Time-Line" Sequential Control.

Thomas A. Edison Inc. has promoted **Robert S. Buritz** to chief project engineer of its Instrument Division. Buritz will be responsible for all phases of product development for both the Instrument Division and Edison Research Laboratory.

Klipfel Valves, Inc., a division of Hamilton-Thomas Corporation, has appointed **Nikolai Belaef** chief engineer. Belaef's new duties will include development and research on all product lines. He has wide background in automatic control and high-pressure control valve technology.

Crane Packing Company has announced the death of **Frank Edward Payne**, chairman of the board and cofounder of Crane Packing Company. Payne was a nationally recognized authority in mechanical packings, mechanical seals, Teflon products, and lapping machines.

Morgan Barker

American Society of Mechanical Engineers inaugurated **Joseph W. Barker** president of the 40,000-member society at the banquet session of the Diamond

Jubilee Annual Meeting in Chicago recently. Barker, president and chairman of the Research Corporation, New York, was formerly head of the Electrical Engineering Department at Lehigh University. He also served as dean of engineering at Columbia University for 16 years. He succeeds outgoing-president **David W. R. Morgan**, vice president of Westinghouse Electric Corporation.

The John Fritz Medal, one of the highest honors that can be bestowed by the engineering world, was presented to **Phillip Sporn**, president of the **American Gas and Electric Company.** Mr. Sporn's citation reads: "The Medal is awarded to you as Distinguished Engineer, Pioneer in Utility Engineering Practice, Eminent Executive, Human Administrator." Some previous recipients of the medal have been Thomas Edison and Orville Wright.

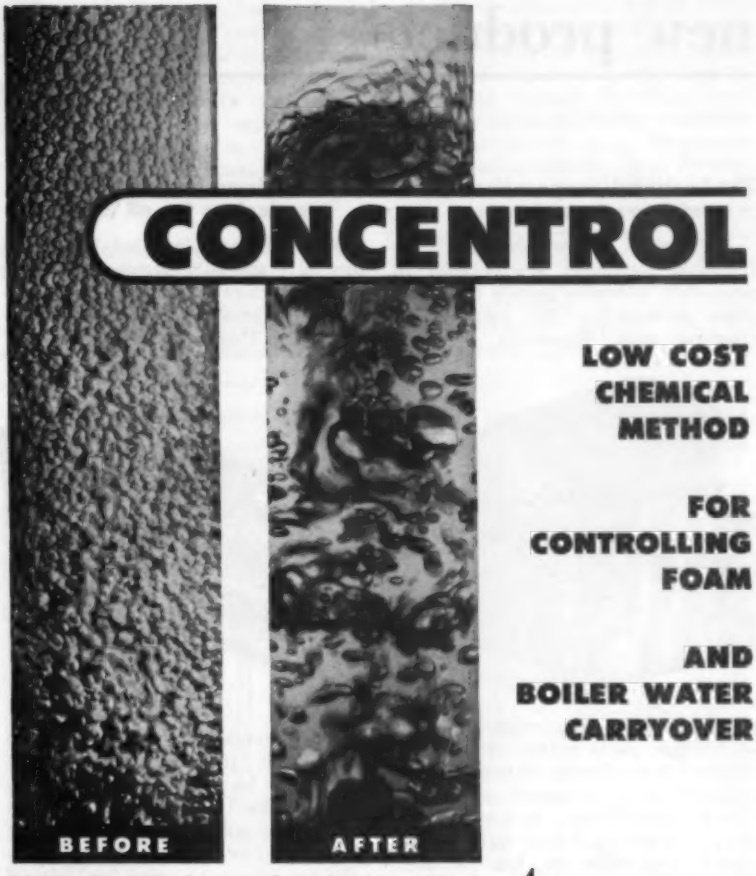
Sporn

Stanford Research Institute has appointed **John I. Yellott** assistant director. Yellott will head development of the Institute's solar energy research program. He was formerly research director for the Locomotive Development Committee of Bituminous Coal Research, Inc. Yellott holds 25 United States and foreign patents. He was consultant on atomic power for the Manhattan Project during the war years.

General Electric Company appoints two men as managers of newly established engineering posts. **S. S. Price** will be responsible for all product design activities for panelboard and motor-control centers. **A. H. Adams** will supervise switchboard and distribution center design and design activities for switchboards and sectional unit substations.

American Institute of Electrical Engineers has awarded the 1955 Edison Medal to **Leonid A. Umansky**, recently retired manager of engineering, Industrial Engineering Department, General Electric Company. The award, one of electrical engineering's top honors, will be presented January 31 at a special session of the Winter General Meeting of the AIEE. Umansky was cited "for his outstanding contribution to the electrification of industry through the application of electrical machines, devices, and systems to automatic process machinery; and for his inspiration, leadership, and teaching of men in this vital work."

Umansky



Laboratory demonstration shows foaming of highly alkaline solution in glass test cylinder.

Same solution after addition of 12 ppm of Bird-Archer Concentrol antifoam.

CONCENTROL

LOW COST CHEMICAL METHOD

FOR CONTROLLING FOAM

AND BOILER WATER CARRYOVER

LABORATORY PROOF

● Tests and plant operating records in all parts of the country have established the effectiveness and economy of Concentrol chemical treatment to combat wet steam problems. Where boiler water carryover is caused by foaming due to high alkalinity and high proportion of dissolved solids in the water, Concentrol is essentially a surface active agent that causes breakdown of bubble film, preventing foam formation.

Concentrol is supplied in liquid, powder or briquette form—can be fed either continuously or in slugs to boilers. Formulations of Concentrol can include organic sludge conditioning agents and other water treatment chemicals for boiler treatment as well as antifoam. Concentrol eliminates the need for costly pre-treatment of water and high blow-down rate. It is fast acting and resistant to hydrolysis or breakdown under normal boiler temperatures and pressures.

A Bird-Archer 8 Point Service Engineer is as near as your phone. For friendly counsel call him or write directly to Bird-Archer outlining the details of your boiler operations.

Engineering plus Chemistry equal Bird-Archer Service

LABORATORIES · ENGINEERS · CHEMISTS

BIRD-ARCHER WATER TREATMENT

THE BIRD-ARCHER COMPANY, 4337 NORTH AMERICAN ST., PHILADELPHIA 40, PA.

NEW YORK • CHICAGO

IN CANADA: The Bird-Archer Co., Limited, Cobourg, Ontario

IN MEXICO: Calderas y Accesorios, S. A., Amsterdam 291, Mexico, D. F.

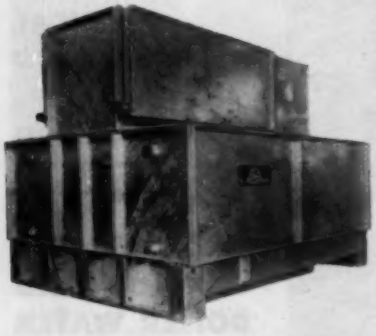
Circle 134 on READ-N-CIRCLE card for more data

new products

. . . starts on page 10

724-Sectional evaporative-type refrigerant condenser

All sections of new evaporative refrigerant condenser are encased in separately movable panels for complete accessibility for painting or cleaning coils. Removing a single



panel opens central plenum and puts all interior parts within reach. Refrigerant is condensed in two parallel mounted coils enclosing a central plenum under fan section. Water sprays are arranged over coils. Available in four sizes—90, 120, 180, and 240 tons. These ratings are for ammonia, although condensers are also applicable to freon. NIAGARA BLOWER COMPANY.

725-New package boiler line

New line of "Red Band" scotch-type steamboiler plants in sizes from 12 to 125 hp for gas, oil, or multiple-fuel firing is now available for every

process heating requirement. All necessary valves, controls, and boiler trim are mounted. Internal piping and wiring is completed. ECLIPSE FUEL ENGINEERING CO.

726-Aluminum inverted-Y conductors for all cranes

New aluminum inverted-Y conductors have specially engineered sliding shoe collectors to handle heavy current requirements of overhead traveling cranes. Conductors are heavy alu-

minum extrusions, and are available in 300-, 500-, 1000-ampere, and larger sizes. May be either side- or overhead-mounted to crane girders or runways by special hangers that permit conductors to float. This obviates need for expansion joints and eliminates strain on insulators. Each collector has two shoes. THE CLEVELAND CRANE & ENGINEERING CO.

727-Portable wire rope straightener

One man can operate new portable wire rope straightener that removes bends, twists, loops, and kinks from all sizes of cable. Length of cable and eyes present no problem. Expense of splicing new eyes in new slings is elimi-

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 75.

nated by renovating used cable. Uses no fittings or dies. Has no parts to wear out or replace. Suitable for all sizes of cable from ¼ to 1½ inches. Comes in two sizes with either cast-iron or aluminum base. Guaranteed to save time and money. CABLE STRATE COMPANY.

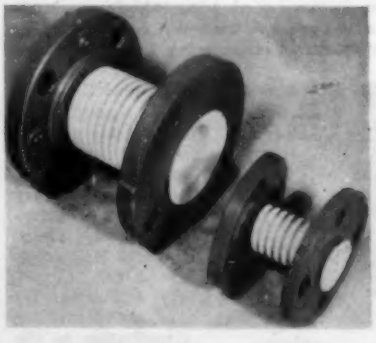
728-Vinyl-jacketed heating cable

Improved performance in soil heating, pipe heating, roof de-icing, and surface heating installations is provided by a new vinyl jacketed heating cable. Cable is for general-purpose applications involving temperatures up to 200 F. It is durable, long lasting, and safe. Constructed of a nickel-chromium resistor with nylon covering, a layer of vinyl insulation, a tinned-copper grounding braid, and

the extruded vinyl jacket. Cable is formed into a loop with the ends terminating in a black rubber grounding cap that is injection-filled with vinylite insulation. Self-contained weatherproof unit operates on any 115 volt system with third wire ground. Output is about 5 watts per foot. GENERAL ELECTRIC COMPANY.

729-Fluorocarbon resin fittings

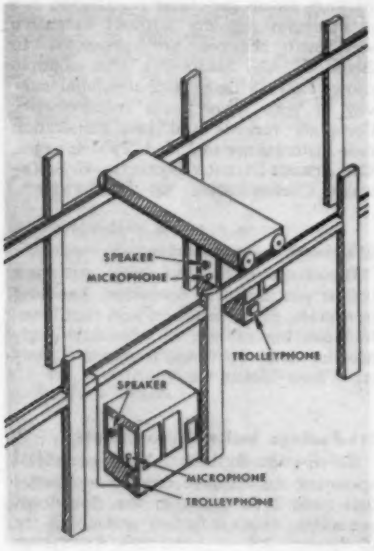
Two more fluorcarbon resin molded pipe fittings are now available. New type of T pipe short-radius elbow comes in both 45-degree and 90-degree



types. Can be used with Fluoroflex-T laminated pipe or any ASA flanged piping. For acids and caustics, foods, and drugs under extreme temperature conditions. RESISTOFLEX CORPORATION.

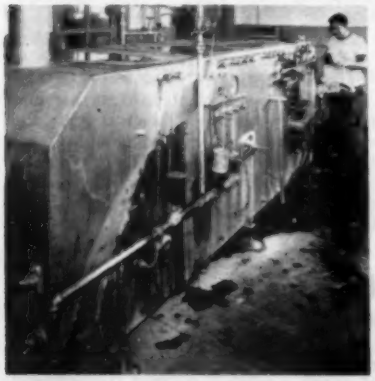
730-Crane communication system

Two-way conversation between fixed stations and operators of moving equipment, or between two or more moving machinery units, is now possible without conventional wiring of a permanent telephone system. Units operate on frequency-modulated carrier current. Energy is derived from existing trolley wires or plant powerlines. Trolleyphone system is a common communication system. Two or more systems can be installed without interference either on a single or on different frequencies. FEMCO, INC.



731-Iron-surfaced floors

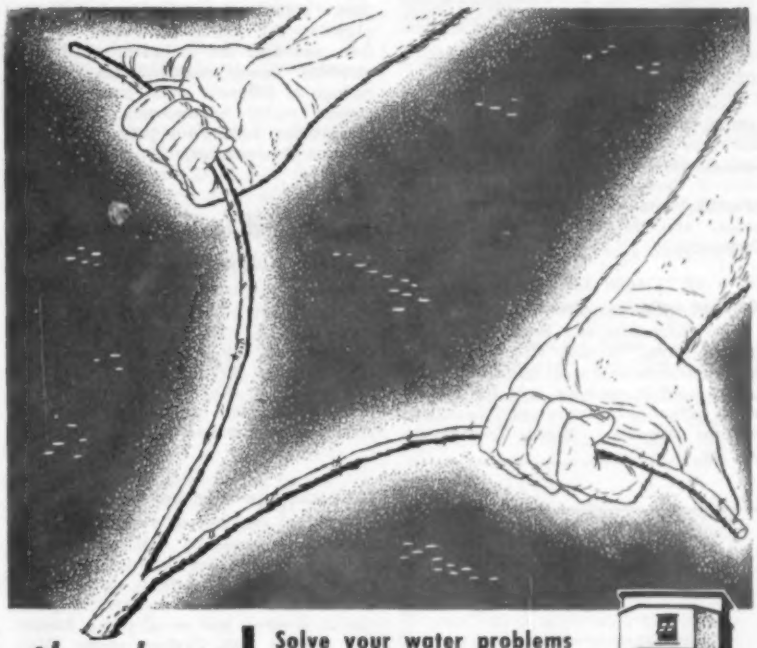
Nonporous, dust-free, and corrosion resistant floor that lasts indefinitely can now be formed with



METAL-FLEX. Because of extremely low porosity, destructive materials, oil and grease are held on the surface, making cleaning easy. Withstands rapid changes in temperature. Product is applied to new concrete as soon as the water has disappeared. Quantity to use is determined by amount of conductivity and nonsparking desired, type and kind of traffic, and whether or not corrosive liquids are present. FLEXROCK COMPANY.

732-All-position iron powder electrode

New all-position iron-powder type electrode gives high speeds and easy operation normally associated only with iron-powder electrodes in down hand operation. Improved Fleetweld 47 is an electrode for high speed welding of mild steel on either ac or dc welding current. Powdered iron in coating produces higher deposition rates, resulting in 10- to 30-percent higher welding speeds. Up to 30 percent more inches of weld per electrode is possible, so fewer electrode changes are required. Bead appearance is smooth and clean, with minimum spatter. Slag is practically self-cleaning. Available in sizes from 1/8- to 5/16-inch diameters. THE LINCOLN ELECTRIC COMPANY.

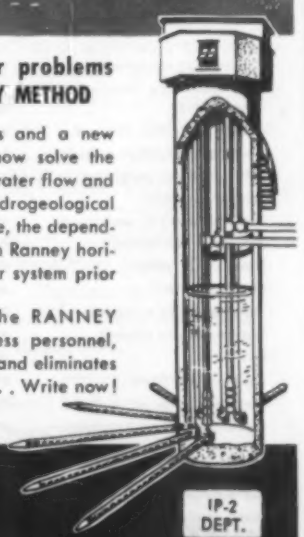


the days of the Divining Rod are long past!

Solve your water problems with THE RANNEY METHOD

The latest techniques and a new scientific approach now solve the problems of ground water flow and infiltration. Our Hydrogeological Division can determine, the dependable capacity of each Ranney horizontal water collector system prior to construction.

The RANNEY METHOD requires less personnel, cuts operating costs, and eliminates costly filter plants. . . . Write now!



RANNEY METHOD
Water Supplies Inc.
841 Alton Columbus 19, Ohio

IP-2 DEPT.

Water Supply Engineers and Contractors
Associate: Ranney Method Western Corporation

Circle 136 on READ-N-CIRCLE card for more data

free bulletins

. . . just circle key numbers on READ-N-CIRCLE card on page 75

Air cleaning equipment

500-Dust collector manual

Dust collectors, including cyclone, wet or dry dynamic, and cloth screen arrester types are the subject of a 32-page bulletin. Uses of air conditioning, ventilating, conveying, drying, and cooling units are presented. KIRK & BLUM MFG. CO.

502-Efficient dust collector

Collector with high collecting efficiency, constant pressure drop, long life, and easy maintenance is discussed in Data Series 1-ATC. What the unit is and what it does are described with construction details, dimensions, case histories, and capacities. THE THERMIX CORPORATION.

503-Dust collection manual

"The Collection and Recovery of Industrial Dusts," 32-page Manual 101, discusses various types of dust and techniques used in analysis, lists the factors which influence choice of equipment, and explains operation. BUELL ENGINEERING CO., INC.

SUBJECT INDEX

Air cleaning equipment 86
Air conditioning, heating, ventilating 86
Boilers and boiler accessories 86
Building construction, materials 86
Compressed air supply 87
Corrosion control 87
Drafting methods, equipment 87
Electrical distribution 87
Electrical utilization 87
Fire protection 88
Fuels and firing equipment 88
Instruments and controls 88
Lubrication 88
Maintenance items 89
Materials handling (bulk) 89
Mechanical power transmission 89
Piping, tubing, and hose 89
Pumping equipment 89
Refractories and insulation 91
Traps, strainers, and separators 91
Valves and regulators 91
Vibration and noise control 91
Water supply and treatment 91

Air conditioning, heating, ventilating

504-Fan performance tables

Belt-driven fans for commercial, light-duty and heavy-duty industrial exhaust applications are described in Bulletin 7214. Features of the fans and their application are discussed. Tables of performance data are included, which give electrical power requirements, delivery ratings at different static pressures, fan speeds, motor horsepowers, and other engineering data. Four pages. AMERICAN BLOWER CORPORATION.

Boilers and boiler accessories

506-Boiler instrument handbook

Boiler instruments to cover every phase of operation from water treatment to dust removal are contained in Bulletin GSP-901. Illustrations and text are combined to make this bulletin a necessity for engineers interested in boiler and steam problems. Twenty-six pages. HAGAN CORPORATION.

507-Package medium boilers specs

Principal features of design and performance of compact, medium-pressure, package boilers are presented with sketches and engineering specifications in Bulletin P-391. Also included is a section on controls and an oil pump, heater, and strainer unit. Sixteen pages. COMBUSTION ENGINEERING, INC.

508-Standardized steam generators

Pre-engineered, standardized steam generators in nine sizes, with capacities from 50,000 to 150,000 pounds per hour, are described in Bulletin B-55-4. Standardized generators assure minimum initial and operating costs with promptest delivery schedules. Schematic and cutaway drawings of the units and design features are included. Four pages. FOSTER-WHEELER CORPORATION.

509-Blowdown control chart

Determination of the rate of boiler blowdown and selection of a correctly sized heat exchanger are made possible with use of simplified Chart JPC, based on total dissolved solids in boiler water. Also given are recommendations for selection of blowdown equipment in accordance with normal operating conditions of the boiler installation. HENSLEY COMPANY.

511-How to survey your steam needs

Formulas behind all package steam generators and illustrations of how a package steam generator installation can raise steam capacity without extensive structural changes are presented in Booklet "Sales Steam-2-1." An example shows how to make a professional survey of your own steam requirements. Complete records and two installation case histories are included. Twelve pages. CYCLOTHERM DIVISION, NATIONAL-U. S. RADIATOR CORPORATION.

513-Handbook on startup

Handbook covers washing out new boiler, putting it in operation, handling in service, firing methods, and shutdown. Includes big section of everyday engineering data. Forty-eight pages. TITUSVILLE IRON WORKS CO.

516-Package boiler improvements

Seven-page Bulletin AXY-1 gives full operating details and describes changes that have been made in the Amesteam generator, which is factory assembled, for 15 through 200 psi pressures. AMES IRON WORKS, INC.

519-Blowoff heat is free heat

Recover practically all of the heat of the blowoff water in a continuous blowoff system. Bulletin 5700 uses diagrams and text to explain how this steam may be used to heat feedwater in an open or deaerating heater and how it may be condensed in a closed heater or flash condenser to heat feedwater at a point beyond the deaerating heater. COCHRANE CORP.

521-Boiler instrumentation data

Modern power plant instruments and control systems are described with the aid of photographs and schematic drawings in Bulletin 55-605-83. Combustion instruments and panels are treated in detail. Twenty-four pages. THE HAYS CORPORATION.

Building construction, materials

522-How to build better masonry

Recommended practice covering materials, proportioning, mixing, and laying of units is offered in Bulletin WP6.55-35M. Three essentials to better masonry and four essentials to better mortar are given with quantity reference tables. Twenty-four pages. UNIVERSAL ATLAS CEMENT COMPANY.

524-How to use glass blocks

"How to Modernize Old Windows with PC Glass Blocks," seven-page Bulletin GB-104 points out that glass blocks have greater insulating value than sash windows, provide better daylighting, and are easier to clean and maintain. Drawings show how blocks will fit any existing window opening. PITTSBURGH CORNING CORP.

525-One-piece grating and treads

Load characteristics, types, and sizes of a complete line of electroforged steel and interlocked aluminum grating are described in Bulletin 2486. The high strength, easy maintenance, open area, and provision of safe footing are discussed. A table of safe loads is included. Sixteen pages. BLAW-KNOX COMPANY.

Compressed air supply

528-Heavy-duty package compressors

Double-acting stationary compressors in package units that are compact, easily installed, economical, and flexible are described in Bulletin 766-5. Diagrams and photographs explain these units with capacities from 400 to 1650 cfm at 80 to 125 psi. Twenty pages. CHICAGO PNEUMATIC TOOL COMPANY.

530-Pneumatic regulator handbook

How to select pressure and vacuum regulators, ratio relays, and system purge assemblies is told in Bulletin H-2. Dimensioned sectional views, typical installations, and complete descriptive information are included. It also contains list of bulletins giving detailed information on other valves. Eight pages. CONOFLOW CORPORATION.

Corrosion control

531-Meet the film-forming amines

"Film Forming Corrosion Inhibitors Also Aid Heat Transfer," four-page Technical Paper No. 129, contains references to protection afforded by filming amines and attendant reduction in maintenance costs secured through protection against corrosion. W. H. & L. D. BETZ.

532-Prevent boiler tube corrosion

Bulletin TR-537 discusses causes and methods of eliminating corrosion in boiler tubes. The data contained is the result of extensive studies by metallurgical experts. Eight pages. BABCOCK & WILCOX COMPANY.

Drafting methods, equipment

533-Drafting equipment buying guide

Helpful buying guide for drafting machines, drawing boards, T-squares, parallel rules, and all drafting office equipment. Thirty-two pages. FREDERICK POST COMPANY.

Electrical distribution

534-Lowdown on dry transformers

The applications, sizes, types, and construction of air-cooled dry-type transformers is described in Bulletin 155. Specifications are included. Special custom-built transformers and reactors are discussed. Eight pages. SORGEL ELECTRIC COMPANY.

535-Conduit that beats corrosion

Test data shows how specially protected heavy-duty rigid-steel electrical conduit stands up under corrosive attacks of salt spray, acid, alkali, and in other environments that have extreme moisture and heat conditions. A special baked-on coat of pigmented and plasticized vinyl chloride acetate copolymer, gives exceptionally high corrosion-resistance. NATIONAL ELECTRIC PRODUCTS CORPORATION.

538-How to choose circuit breakers

All essential information on the selection and application of molded case and large air circuit breakers is presented in this Speedfax catalog. Application sections make extensive use of charts and tables to explain selection of circuit breakers for motor circuits, bus duct, conductors, and transformer secondary applications. Also included are the latest prices, dimensions, and ordering instructions—arranged and indexed to reduce reference time and eliminate errors. Sixty pages. I-T-E CIRCUIT BREAKER COMPANY.

539-Correct that low power factor

Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. SPRAGUE ELECTRIC CO.

Electrical utilization

542-Immersion heater data charts

Electric immersion heating elements for industrial, commercial, and domestic use are described in Bulletin EC-53. Contains data charts, descriptive material, and total wattage requirements for heating of solids, liquids, or gases. List of custom-made heaters is included for special problems. Twenty-six pages. CUTLER-HAMMER, INC.

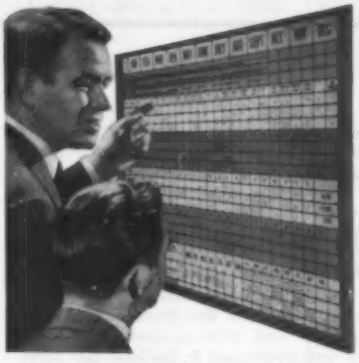
543-101 Ways to heat with electricity

Industrial electric heating applications and methods are described in 32-page Booklet, "101 Ways to Apply Electric Heat." Illustrated case histories show experience-tested ways to apply metal-sheathed Chromalox electric heating units in industrial jobs. EDWIN L. WIEGAND CO.

544-Control devices guide

Photos, diagrams, and specifications for key switches, impulsing devices, switch-

You Get Things Done With Boardmaster Visual Control



★ Gives Graphic Picture of Your Operations—Spotlighted by Color
★ Facts at a glance—Saves Time, Saves Money, Prevents Errors
★ Simple to operate—Type or Write on Cards, Snap in Grooves
★ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
★ Made of Metal, Compact and Attractive, Over 60,000 in Use

Complete price $49.50 including cards

FREE 24-PAGE BOOKLET NO. P-20 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS

55 West 42nd Street • New York 36, N.Y.

Circle 126 on READ-N-CIRCLE card

"Noise Control"

A NEW publication exclusively devoted to the discussion and solution of noise problems in industry and cities. Written and edited by leaders in the field. If you have a noise problem, you need NOISE CONTROL.

"General Principles of Reducing Noise in Machinery."
"Plant Planning for Noise Reduction."

Send for sample copy containing above articles. Request must be on company letterhead.

NOISE CONTROL

Dept. I, 57 East 55 Street
New York 22, N. Y.

Circle 138 on READ-N-CIRCLE card

free bulletins

. . . starts on page 86

board lamps, and other control devices are given in 28-page Bulletin 4018-D. AUTOMATIC ELECTRIC CO.

Fire protection

545-Useful facts on fire fighting

Engineering data and useful facts on Foamite Airfoam fire protection systems, portable and semi-portable equipment, are well illustrated in Bulletin AD 17004-10M. Information to help combat various types of flammable liquid fires is included. Thirty-six pages. AMERICAN LA-FRANCE CORPORATION.

Fuels and firing equipment

546-Stokers are more flexible

Stokers for bituminous coal and anthracite are explained in detail with many illustrations in Bulletin 553. Complete specifications and ratings are included. Photographs and drawings of side ash dumps are also given. Twelve pages. CANTON STOKER CORPORATION.

547-Underfeed stokers explained

The latest refinements in single retort underfeed stokers are discussed in 12-page Catalog SB53. Both the fluid ram and gear drive units are described in detail by means of text, elevation drawings, and cutaway views. ERIE CITY IRON WORKS.

551-Burn refuse simply

Simple and effective method of firing refuse and cellulose fuels in a spreader stoker fired unit is discussed in Bulletin 5M-455. This pneumatic refuse fuel distributor has no moving parts and spreads a thin fuel bed for quick response to load changes. Eight pages. RILEY STOKER CORPORATION.

Instruments and controls

552-Electronic control system principles

Components of the Autronic control system, and all-electronic system for power instrumentation is described in Bulletin A1.3-1. A brief description of the function and working principles of each unit is presented with illustrations. Four pages. THE SWARTWOUT COMPANY.

553-How to select liquid-level control

Bulletin-1 discusses the factors to be considered in selecting a liquid-level control. It includes controls in types and sizes for handling practically any liquid, at any pressure and any temperature. Eight pages. MAGNETROL, INC.

554-New magnetic liquid-level control

Float-operated control using magnetic fields of force to open and close electrical switches is explained in Bulletin L-119. Operates at pressures up to 250 psig. It controls boiler feed pump from the boiler water level, provides a low-water fuel cutoff, and closes electrical circuit for alarm signal. Four pages. MCDONNELL & MILLER, INC.

555-All-purpose water flow meters

Principles of operation of nutating-piston-type meters are explained in Bulletin 36. It contains illustrations and data of typical installations, trap strainers, air release valves, high-pressure meters, and meter registers for the measurement of most fluids. Twenty pages. BUFFALO METER CO.

Steam or mechanical atomizing...1 to 1000 gallons per hour

Designed for operation with either gas, oil or both with natural or forced draft. They can be depended on for maximum combustion efficiency.

ENCO Interchangeable Oil-Burners can be changed instantly to operate by either steam or mechanical pressure atomizing over a wide capacity range.

ENCO Oil Atomizers are applied to various types of standard pulverized-coal and gas-burner units cold starting or for full load operation when coal or gas is not available, or when oil is the more economical fuel.

Send for Bulletin OB-53 describing ENCO Gas and Oil Burners, also complete Pumping and Heating Units.

EC 905

THE ENGINEER COMPANY, 75 West Street, New York 6, N. Y.

Circle 116 on READ-N-CIRCLE card for more data

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 75.

557-How to select temp control

Temperature ranges and other properties of liquid expansion, gas-pressure, and vapor-pressure filled systems are tabulated to aid in selection of control systems for any application in Catalog 12-A-10. Line of instruments for indicating, recording, controlling, transmitting, compensating, and programming temperatures from –400 to +1000 F are also described. Twenty-four pages. FISCHER & PORTER CO.

Lubrication

558-Do's and don'ts for bearings

A helpful list of "do's" and "don'ts" to prolong bearing life appears in Bulletin 506. Also included is information on the storage and handling of lubricants. Four

pages. NEW YORK AND NEW JERSEY LUBRICANT CO.

559-Diesel lubrication revised

Written for everyone interested in the lubrication of diesels, "Lubrication of Diesel Engines," has been revised as Technical Bulletin B-1, 48 pages. It discusses diesel principles and design, types of engines in use, operating cycles, accessories, and lubricant choice. SUN OIL CO.

560-Oil seal manual for quick reference

Quick reference manual covers selection, application, and installation of clipper oil seals. Descriptions cover the latest seal designs, including extruded and molded oil slingers and end face seals. Essential data is in tabular form. Important points are well illustrated. Twenty-eight pages. JOHNS-MANVILLE.

Maintenance items

561-New electrodes for boiler repair

New line of low-alloy steel arc welding electrodes for boiler repairs and high pressure piping fabrication is contained in Bulletin 55CM. Electrodes eliminate weld cracking and reduce stress-relieving to a minimum. Preheat temperatures can be decreased to reasonable levels. THE CHAMPION RIVET COMPANY.

563-Repair methods handbook

Text and illustration in this 48-page handbook present repair methods for leaks in pipes, boilers, radiators, concrete, cinderblocks, and sheet and plate metal. Directory describes 12 repair cements and jobs they will do. SMOOTH-ON MFG. CO.

567-Pocket handbook on alloys, fluxes

Information for all engineers responsible for jointing, tinning, or cutting of steel, aluminum, and aluminum alloys, cast iron, copper, copper-bearing alloys, magnesium, nickel, monel, stainless steel, and zinc die-cast is now available in pocket-sized handbook. Data on 15 alloys not previously cataloged are included. Thirty-two pages. ALL-STATE WELDING ALLOYS CO., INC.

Materials handling (bulk)

569-Pneumatic vibrators stop clogs

Factual and photographic information on the uses of pneumatic vibrators is included in Catalog 109. Equipment is for use with continuous line pressures from 25 to 100 psig, and on bins containing from one to several hundred tons. Sixteen pages. THE CLEVELAND VIBRATOR COMPANY.

570-Belt conveyor design handbook

Engineering data required to design a belt conveyor for any application are presented in 86-page Catalog 852. The booklet, published to serve as a handbook on conveyor design, states that many problems can be answered by using a standardized unit. THE JEFFREY MFG. CO.

572-How to store bulk materials

Storage bins for bulk materials such as ashes, coal, coke, sand, or lime are fully discussed in this bulletin. Contains tables of flowable materials densities, capacities, description of wall construction, test data, and other relevant engineering data plus many photographs, and line drawings. Twenty-nine pages. THE NEFF & FRY CO.

573-Conveyor belt slide rule kit

Two slide rules that cut the time required for designing a conveyor belt installation from three hours to ten minutes are now available. They are part of a conveyor belt construction kit. One is a horsepower calculator. The other is a carcass selector. They incorporate the engineering data contained in a 40-page conveyor belting notebook. UNITED STATES RUBBER COMPANY.

Mechanical power transmission

574-V-belt rating manual

"Multi-V-Drives," this 100-page master engineering manual presents a scientific and simplified method for rating V-Belts. In addition to accepted theories on V-drive engineering, factors such as small diameter sheaves, centrifugal force, average hours per day operation, and other conditions affecting belt lines have been considered. WORTHINGTON CORP.

Piping, tubing, and hose

578-Data on pipe fabrications

Specifications for all sizes of pipe from ⅛ to 24 inches in diameter are presented in 16-page Catalog 575C. Tables give data and descriptions of standard, extra strong, and double extra heavy pipe, spiralweld pipe, large OD pipe, line pipe, electric-weld tubing, welding fittings and flanges, oil well casing, and water well casing. Facilities for fabricating pipe are also discussed. L. B. FOSTER CO.

Pumping equipment

585-How to figure pump heads

How to determine total head against which pump must operate is only one of the valuable sections in 12-page Bulletin 353-1000 on the Bilton pump, a general purpose pump suitable for medium and low head service. BYRON JACKSON DIVISION, BORG-WARNER CORPORATION.

587-Centrifugal pump manual

Dimensional drawings, selection charts, and performance tables for the complete line of general purpose centrifugal pumps

A FULL TIME TRAFFIC COP
on your fluid hiway

HENSZEY
FLOW METERS
with Alarm Control

RINGS A BELL—LIGHTS A LIGHT or
ACTIVATES a MOTORIZED VALVE

There are only three moving parts in the HENSZEY FLOW METER — no breakdown due to complicated gears and mechanism. Goes right in the line — no additional supports. Indicates flow within 3% absolute accuracy, even with pulsating flow. Send for bulletin.

SOUND ALARM AT
HIGH OR LOW FLOW!

Easy to set on face of switch — unaffected by dust, dirt or corrosion — no pitting or sticking.

HENSZEY COMPANY
DEPT. A1, WATERTOWN, WISCONSIN
Circle 120 on READ-N-CIRCLE card for more data

reprints available

. . . from industry & power

Special Report reprints

Individual copies of Special Report Reprints will be sent free upon request. Additional copies are priced as follows: 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies are 10¢ each. Special Report Reprints available are:

- *Adjustable Speed Drives and Electrical Controls*
- *Combating Corrosion From Industrial Chemicals*
- *Contaminants in the Air*
- *Control Valves and Positioners*
- *Demineralization—A Means to Purer Water*
- *Industrial Waste Treatment*
- *In-plant Electrical Distribution*
- *Review and Forecast, 1956*
- *A Thermodynamics Refresher (Parts I through VI)*

Reprints of Special Reports and feature articles that have appeared in INDUSTRY & POWER can be ordered from Reader Service Department, INDUSTRY & POWER, Commercial Bank Building, St. Joseph, Michigan.

Feature article reprints

Reprints of the following articles are available on single copy orders free of charge.

- *Big Savings For A Plant*
- *Boiler Blowdown Control*
- *Bulk Handling as a Business*
- *Coal Dust . . . Stopped Before It Starts*
- *Electrically Heated Pipelines Keep Fuel Oil Flowing*
- *Engineered Insulation*
- *For Better Lighting At Less Cost, Frost Your Windows*
- *How To Specify a Water-Tube Package oiler*
- *New Chemical Grouting Method Prevents Flooded Floors*
- *Noise Abatement In Industry*
- *Packaged Units for Coal Firing*
- *Permanent Tank Insulation Costs Less*
- *Profit From Wastes*
- *Purchased Vs Generated Power*
- *Put Dissolved Air to Work*
- *Reclaim Your Waste Heat*
- *Selecting Fuel and Firing Equipment*
- *Selecting Taps on Power Transformers*
- *Shell Selects Package Boiler for Outdoor Operation*
- *Solving a Fly Ash Problem*
- *Synchronous Motors Do Two Jobs At One Time*
- *Tailor-Made Fire Protection*
- *Television . . . The Eyes of Industrial Control*
- *Vibration Is Tamed So Simply*
- *Which Should It Be . . . Electric or Pneumatic Controls?*
- *Why High Temperature Water?*
- *Will It Pay to Incinerate Your Wastes?*

The City of Belvidere, Illinois has the following Diesel-electric equipment for sale:

2—Fairbanks-Morse Exciter
Serial # X50868 — X50904
Type MX Frame 10A KW7½
Shunt wound—60A 257RPM
Volts — No Load — Full Load 125
Continuous Duty 40 deg. C.
125% Load 2 Hrs 55 deg. C.

2—Fairbanks-Morse Alternator
Serial # B123 & B120
Type E Frame V KVA 95
RPM 257 Ph 3 Cy Co Volts 2400
% P. F. 80 Amps per term 23.0
Field Amp 100% P.F.—80% P.F. 46.0
F. Volts 120 T. Rise 50 deg. C. Cont. Duty

2—Fairbanks-Morse Diesel
Model 32
HP 120 RPM 257
Style VA
Serial # 732775 & 756395

4—Air Tanks
250# W.P. 500# T.
Circumf. Outside 64¾"
Ht. 5'-0"

1—Switchboard
1—Air Compressor
3—Oil Filters
2—Silencers

Equipment may be seen in operation by contacting Mr. Wayne Richardson, Water Superintendent, c/o Water Works Pumping Station, Belvidere, Illinois.

Bids will be based upon the purchaser removing, crating, and shipping equipment. Bids will be opened in the City Council Chambers at 1:30 P.M. on February 18, 1956.

Classified Advertising

Save on Your
INDUSTRIAL TRACK
FOSTER QUALITY
FULLY GUARANTEED
RELAYING RAILS
Handle more cars better—cost less to install and maintain. Foster stocks all Rail Sections 12# thru 175#, Switch Material and Track Accessories.
SEND FOR CATALOGS
RAILS - TRACK EQUIPMENT - PIPE - PILING
L B FOSTER CO.
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
ATLANTA 8 • HOUSTON 2 • LOS ANGELES 5

PROPANE GAS PLANTS
and
Anhydrous Ammonia Plants
PEACOCK CORPORATION
Box 268, Westfield, N. J. Westfield 2-4288

complete Anhydrous Ammonia and L.P. Gas plants
designed - installed
H. Emerson Thomas & Associates, Inc.
P. O. BOX 270 WESTFIELD, N. J. WE 2-2800

free bulletins

. . . starts on page 86

are included in Bulletin 7223-A. Suction and discharge positions, as well as V-belt, direct drive, and gear drive modifications, are also shown. Bulletin gives data on pumps with capacities of from 5 to 2800 gpm, and operating pressures of from 10 to 525 feet total head. Includes installation examples for the complete line. Sixteen pages. INGERSOLL-RAND.

Refractories and insulation

591-Refractory properties tabulated

Entire range of products and typical applications of each are covered in Bulletin 67. P.C.E. temperature service range, storage properties, setting characteristics, and other data are tabulated. Four pages. PLIBRICO COMPANY.

Traps, strainers, and separators

592-Porous bronze filters fuels, air

Basic information on the advantages of porous bronze as a filtering medium and complete engineering data on bronze filters already in use on industrial applications are offered in this new bulletin. The company's free creative engineering service is also discussed. Sixteen pages. PERMANENT FILTER CORPORATION.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 75.

Valves and regulators

596-Simple valve cross-index

Valve users can easily obtain data on valves for a wide variety of applications by using the simplified cross index in 27-page Catalog 105. The most widely used cast and forged steel Edward globe and angle stop, non-return, check, gate, hydraulic, relief, mudline, flow-off, instrument valves, and strainers are included. EDWARD VALVES, INC.

597-Valve and regulator data

Specifications and operational data for steam, gas, air, oil, and water regulating equipment are presented in 60-page Catalog 54. Illustrations and descriptions are included for pressure, temperature, and combination regulators, diaphragm, float, motor, solenoid, pop, and relief valves. O. C. KECKLEY CO.

Vibration and noise control

598-Vibration isolator features

Features and uses of the Type 5200 shock and vibration isolators are given in eight-page booklet 541. Graphs give data for isolator loads, shock transmissibility, vibration transmissibility, and coupled natural frequencies. Attachment and installation instructions are provided. THE BARRY CORP.

Water supply and treatment

602-Cooling tower water pH control

"L&N pH Control of Cooling Tower Water," four-page Data Sheet 700 (1), offers suggestions on measurement and control of pH of cooling tower water, and describes equipment for this application. How pH control can conserve makeup water, protect wood, prevent scale, and minimize slime is explained. LEEDS & NORTHRUP CO.

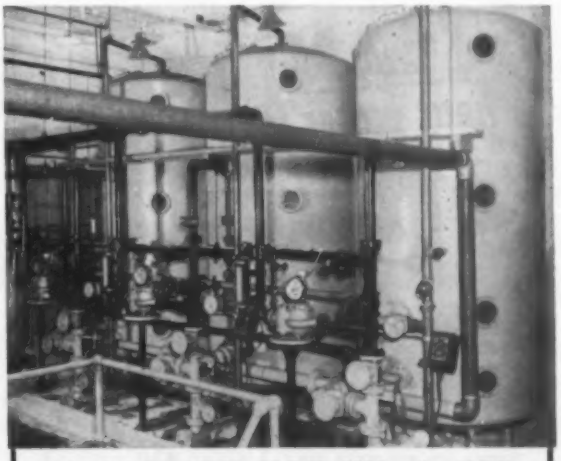
coming next month in
INDUSTRY & POWER . . . .

buying corrosion control?

Corrosion control equipment for steam plants is more important today than ever before because damaged equipment is increasingly expensive to replace and water itself is becoming more expensive. Here, then, is an article aimed at the buyer of water treatment equipment, spelling out the particular virtues of individual systems.

With this information in your hands, you can buy the right kind of equipment to meet your needs. Whether you are in the market or not at this minute, you can not afford to miss this article coming up in the

February issue of
INDUSTRY & POWER



18,000 GPH H&T UN-A-BED DEMINERALIZER PLANT

. . . a typical H&T installation

Since 1943, we've been building demineralizer plants. All sizes, all capacities — manual or automatic available. Highest quality, attractive prices, fully guaranteed. Hundreds of units in service.

Also a complete line of other water conditioning systems.

Write for details.

HUNGERFORD & TERRY, INC.

CLAYTON 1, NEW JERSEY

Circle 135 on READ-N-CIRCLE card for more data

REPUBLIC
"LO-TORQ"
SELECTOR VALVE

- 0-6000 psi service
- Low turning torque
- Panel mounting
- Semi-steel, bronze, aluminum alloy
- No leakage at any time
- 3 types of portings

Write for catalog No. 454 for complete information.
Distributors in principal cities from coast to coast.

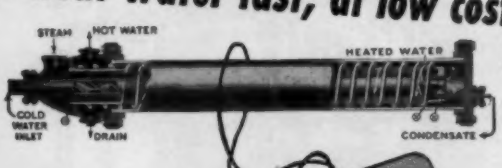
CHECK RELIEF PLUG GLOBE NEEDLE

132

RM REPUBLIC MANUFACTURING CO.
15655 BROOKPARK ROAD • CLEVELAND 11, OHIO

Circle 131 on READ-N-CIRCLE card for more data

STEAMLINED!
to heat water fast, at low cost



In the Johnson Heater, water to be heated is routed first inside, then outside, a blanket of live steam. It's full pressure steam, too; up to 150 lbs., or 250 lbs. in heavy duty types, no reducers are needed. The result: faster, more efficient heat transfer for a unit of its size. No wonder industry has found so many applications for the Johnson "Instant" Heater, in heating water and process liquids of various types.

Sizes for all needs; write for literature

The Johnson Corporation
807 Wood St., Three Rivers, Mich.

Circle 101 on READ-N-CIRCLE card for more data

advertisers' index

Airetool Mfg. Co. ..... *
Allis-Chalmers Mfg. Co. ..... *
American Institute of Physics ... 87
American-Marsh Pumps, Inc. ... *
Ames Iron Works, Inc. 19
Annin Co. ..... *
Armstrong Machine Works ..... *
Aurora Pump Div., N.Y. Air Brake Co. ..... *
Automatic Electric Sales Co. ... *

Babcock & Wilcox Co., Boiler Div. ..... *
Refractories Div. ..... *
W. H. & L. D. Betz 7
Bigelow-Liptak Corp. ..... *
Bird-Archer Co. 83
Boiler Engineering & Supply Co. . *
Buell Engineering Co. ..... *
Buffalo Meter Co. 73
Burgess-Manning Co. ..... *
Bussmann Mfg. Co. 26-27
Byron Jackson Div., Borg-Warner Corp. ..... *

Chapman Valve Mfg. Co. 9
Chesapeake & Ohio Railway 21
Cochrane Corp. 13
Coppus Engineering Corp. ..... *

Darling Valve & Mfg. Co. ..... *
Dart Union Co. ..... *
Dearborn Chemical Co. ..... *
DeLaval Steam Turbine Co. ..... *
Detroit Stoker Co. 14-15
Dynamatic Div., Eaton Mfg. Co... *

Eaton Mfg. Co., Dynamatic Div... *
Engineer Co. 88
Enos Coal Mining Co. ..... *
Erie Bolt & Nut Co. ..... *
Erie City Iron Works ..... *
Ernst Water Column & Gage Co... 72
Ess Instruments Co. 80
Everlasting Valve Co. ..... *

Flexrock Co. ..... *
L. B. Foster Co. ..... *

General Coal Co. ..... *
Graphic Systems 87

Hays Corp. ..... *
Heinemann Electric Co. ..... *
Henszey Co. 89
Hilliard Corp. ..... *
Hungerford & Terry, Inc. 91

Infilco Inc. ..... *
I-T-E Circuit Breaker Co., Small Air Circuit Breaker Div. .. *
Switchgear Div. 11
Illinois Water Treatment Co. .... *

Johns Manville Corp. 23
Johnson Corp. 92

Kalamazoo Tank & Silo Co. ..... *
Kano Laboratories ..... *
Kirk & Blum Mfg. Co. 4

L*A Water Softener Co., Inc. .... *
Leslie Co. 2
Liquidometer Corp. ..... *
Lovejoy Flexible Coupling Co. .. *

Magnetrol, Inc. 29
Jas. A. Murphy & Co., Inc. 20

National Airoil Burner Co. ..... *
New York & New Jersey Lubricant Co. ..... *
Niagara Blower Co. 5
Northern Blower Co. ..... *

Petro ..... *
Pick Mfg. Co. 71
Powers Regulator Co. 81
Prat-Daniel Corp. 17
Proto Tools ..... *

Ranney Method Water Supplies, Inc. 85
Raybestos-Manhattan, Inc. ..... *
Reliance Gauge Column Co. 31
Republic Mfg. Co. 92

Claude Schneible Co. ..... *
Sinclair Refining Co. 3
Smooth-On Mfg. Co. 79
Sorgel Electric Co. 69
Spence Engineering Co., Inc. ... *
Sprague Electric Co. ..... *
Standard Pressed Steel Co. ..... *
Strong, Carlisle & Hammond Co. . *
Struthers Wells Corp. ..... *
Subox, Inc. 25
Superior Combustion Industries, Inc. 74
Superior Electric Co. ..... *

Texas Co. 94
Thermix 17
Titusville Iron Works, Div. of Struther Wells Corp. ... *

Union Iron Works ..... *
Universal Atlas Cement Co. ..... *

Edwin L. Wiegand Co. 6
Thomas C. Wilson 93

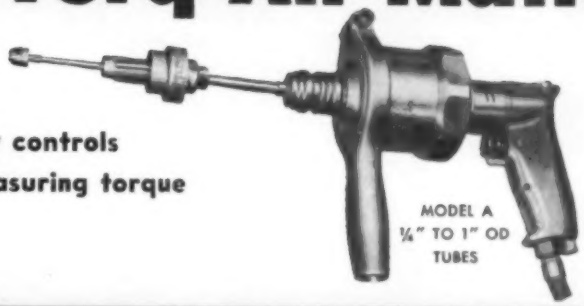
Worthington Corp., Vertical Turbine-Industrial Div. . *

Yarnall-Waring Co. 34

Where an * appears after a name the advertisement does not appear in this issue, but appeared in one or both of the two previous issues.

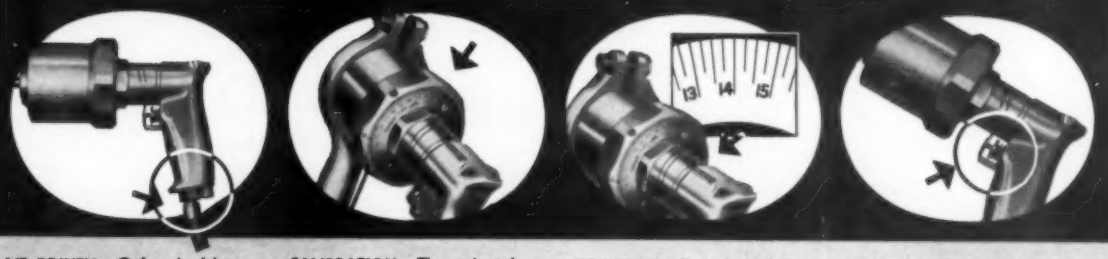
New WILSON Torq-Air-Matic

First and only air-driven tube expander drive that accurately controls tube expansion by directly measuring torque output at the mandrel.



MODEL A
¼" TO 1" OD
TUBES

Look at these exclusive design features of the WILSON Torq-Air-Matic

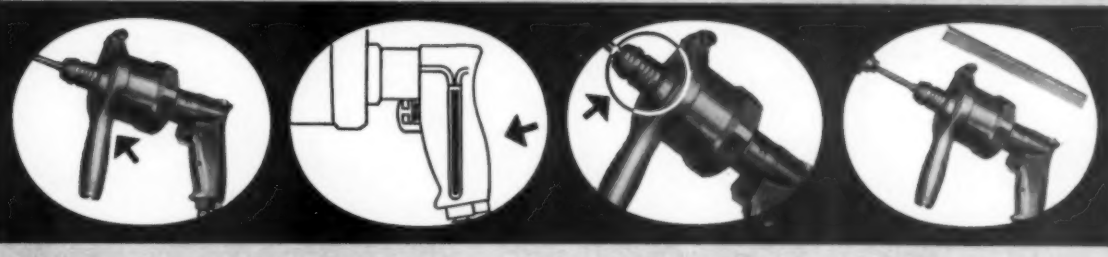


AIR-DRIVEN—Only air-driven tube expander drive with a built-in torque control. *Does not require a separate control box, relays or switches.* No extra cables or wires; just one small air hose serves it.

CALIBRATION—The only tube expander control calibrated in *terms of foot pounds torque instead of meaningless arbitrary units.* Torque requirements for expanding tubes of off-standard jobs can be more readily arrived at.

POWERFUL—Rated to deliver *fourteen foot pounds torque* at 90 psi. This is sufficient to roll 1" OD x 11 gauge boiler tubes.

SIMPLE—Only a *single three-position trigger throttle* for off, forward and reverse. Never any danger of over-rolling because of improper sequence of operation. No juggling of switches; nothing new to learn.



CONVENIENT—*Furnished with an auxiliary handle that can be swivelled to any position desired* by the operator or left off when the torque reaction is not too great. Basic unit is of a pistol grip design.

TROUBLE-FREE—*Has an oil reservoir* built into the handle to supply lubrication to the motor. *The control section is independent of the motor and lubricated for life.*

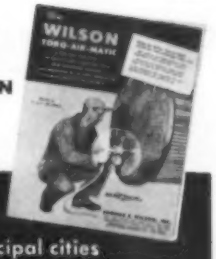
CHUCK—*Simple, new type, snap on floating chuck. Only one motion* instantly engages or disengages a square shank mandrel—no set screws.

COMPACT—*Only 10" overall* from pistol grip handle to instant action chuck.

TW 660

These features speak for themselves. The Wilson air-driven Torq-Air-Matic tube expander drive and control is an important revolutionary advance in the field of precise tube expanding. Here's what you get when you use the Wilson Torq-Air-Matic control for heat exchanger tubes: (1) uniform and tight pressure joints, regardless of tube sheet hole variation; (2) no over-rolled or under-rolled tubes—no stresses that shorten tube life; (3) extended tube expander life, more production, higher profits.

SEND FOR BULLETIN 55



THOMAS C. WILSON, INC.

21-11 44th Avenue, Long Island City 1, New York • Representatives in all principal cities

MANUFACTURERS OF TUBE CLEANERS, TUBE EXPANDERS AND TUBE MAINTENANCE TOOLS

Circle 127 on READ-N-CIRCLE card for more data

DUKE POWER Company turbines at Riverbend Steam Station, Mt. Holly, North Carolina. All seven turbines in this plant, with a capacity of 631,000 kw., are lubricated with *Texaco Regal Oil R&O*. In addition, four turbines, totaling 210,000 kw. capacity, at Duke's Cliffside Steam Station, Cliffside, North Carolina, and six turbines, totaling 440,000 kw. capacity, at Buck Steam Station, Spencer, North Carolina, are also 100% Texaco-lubricated.

NO SLUDGE, NO RUST, NO FOAM IN DUKE TURBINES...

THE REASON WHY: Seventeen of Duke Power Company's steam turbines — having a total capacity of more than 1,281,000 kw. — are lubricated exclusively with world-famous *Texaco Regal Oil* — the oil that, throughout its extra long service life, affords extra protection against sludge, rust and foam, assures clean turbine systems, normal bearing temperatures, instantaneous governor response.

Texaco Regal Oil R&O is made from carefully selected choice base stocks. These are specially refined, then further improved by effective additives and special processing.

There is a complete line of *Texaco Regal Oils R&O* to meet the stringent requirements of all leading turbine builders, for all types and sizes of turbines.

Let a Texaco Lubrication Engineer help you achieve greater power plant efficiency. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL TURBINES

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Circle 124 on READ-N-CIRCLE card for more data